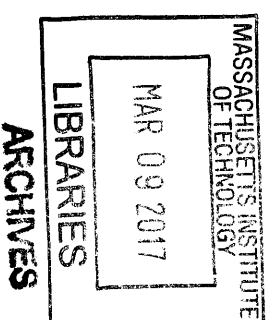


FROM ROOTS TO ROUTES

by

Xinyi Ma

B.S. Civil Engineering, A.B. Arts
Lafayette College, 2013



SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARCHITECTURE
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEBRUARY 2017

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ABSTRACT

FROM ROOTS TO ROUTES

by
Xinyi Ma

Submitted to the Department of Architecture on January 19, 2017
in Partial Fulfillment of the Requirements for the Degree of Master of Architecture

Over the past two decades, more than 200 million people in China moved from rural to urban areas. These migrants fled the countryside, which is regarded as an economic wasteland in perpetual stagnation that is locked by feudal traditions and peasant values, to the largest cities. They sought to be connected to a modern China, one that is marked by a booming economy and pronounced popular culture. These rural-to-urban migrants have formed the largest peacetime inland migration in history.

Mobility is a socially produced motion that often bears ideologies. It is associated with a desire for progress, freedom, and opportunity. The massive inland migration in China demonstrates the tremendous social force that aims to overcome the outdated social strata. However, as migrants move, limitations on mobility emerge. The Hukou, the household registration system in China, is an institutional framework

that has entrenched the social strata for ages. Records of births, marriages, and moves identify each person with a place. As soon as migrants move from their designated origins, immobility appears: welfare exclusion, job inequity, urban transit inaccessibility, to name just a few.

This thesis proposes to study this condition of mobility, immobility and estrangement in the district of Minhang, Shanghai, where 1.5 million migrants currently live and work. Scooter, an emerging fast and cheap personal vehicle, is the protagonist in this story of migrants. Linking closely to migrants' life, scooters are not only their primary means of transportation but also their means of production. Its mobility empowers migrants to move beyond their territory, while its unique scale and flexibility links to rich spatial possibilities.

Thesis Supervisor: Arindam Dutta
Title: Associate Professor of Architecture



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ACKNOWLEDGEMENT

Thank you God for taking me on this journey with You. Through detours and adventures, You taught me truly valuable lessons in the last few months of my student life and sustained me with hope, peace and joy in You.

Thank you Arindam, for your guidance, patience and encouragement throughout the semester. I know I was stubborn, didn't listen and constantly went off track, but you were always there to pull me back. Thank you Joel for always being so caring, encouraging, and giving me tons of valuable feedbacks. Thank you Brent for squeezing time from your busy schedule to help me shape this project. Without all three of you, this project won't come together in the end.

Millions of thanks given to my lovely friends and helpers: MyDung, Christina, Olivia, Yifen, Milap, Jingwen, and also my non-architecture friends: Cheer, Lawrence, and Bill. You all together made this happen in the last two weeks! Thanks extends to Alice, my roommate+classmate, and Chenxue, my thesismate. It's a blessing to have you two accompanying me in the journey.

Special thanks given to CRON-thank you Duncan for coming here at 4am to help me with last minute printing(!), and to Caitlin-thank you for giving me valuable advice on structure system.

Finally, I want to thank all the migrants I talked to during site visit, especially LiPing, who gave me a ride on her scooter. This is where this project embarks.

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CHINA | THE BIGGEST PEACE TIME INLAND MIGRATION

MOVEMENT VS MOBILITY

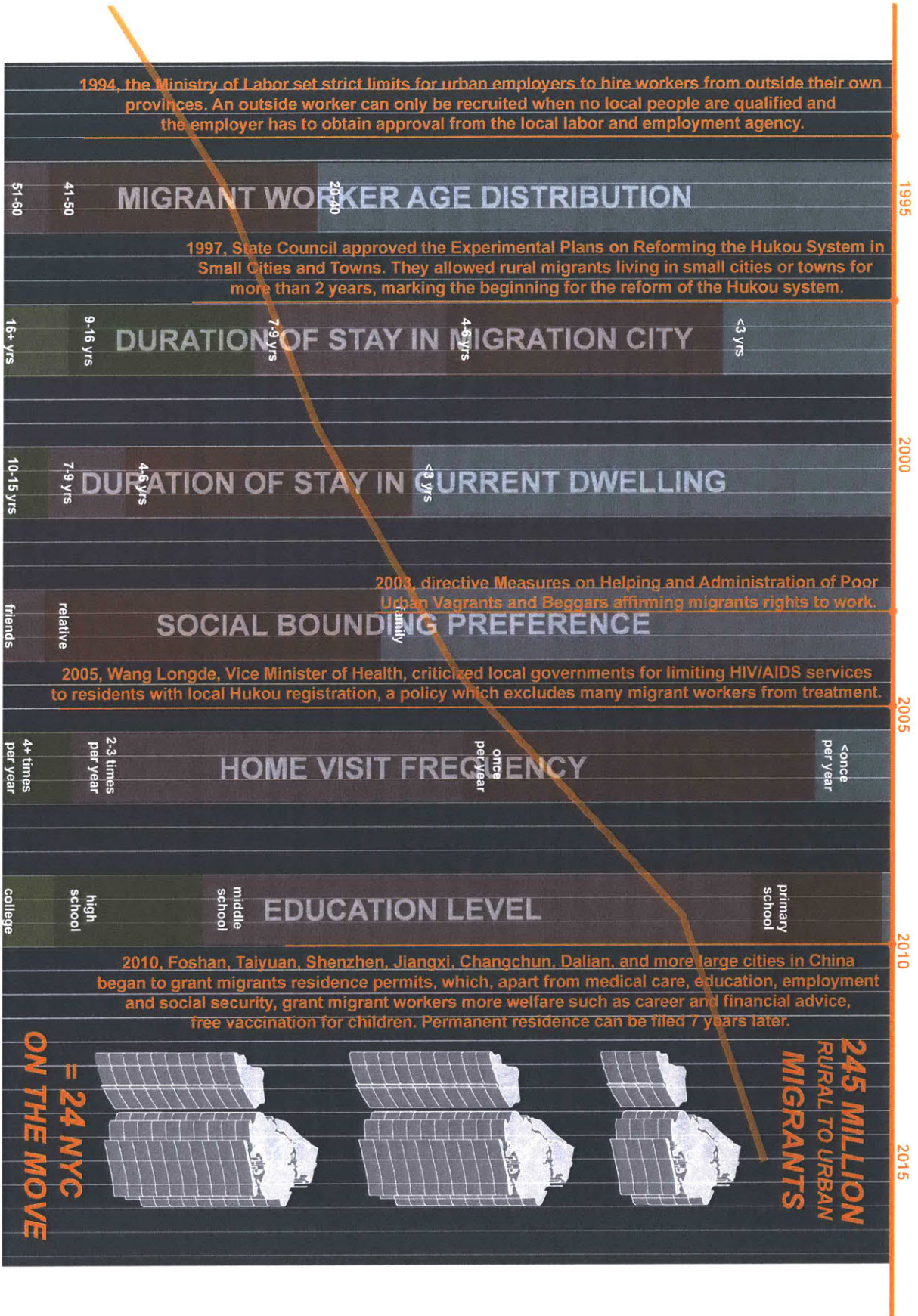
Movement as an act of displacement is devoid of meaning, history and ideology. However, mobility as socially produced motion is charged with meanings. In his book *On the Move*, Tim Cresswell described mobility as the dynamic equivalent of place whereas movement as the dynamic equivalent of location (Cresswell, 2006). How to create dynamic destinations along trajectories of movement? How to engage meanings of the subjects so the destinations are not just locations but places? This thesis explores these questions in the context of mass rural-to-urban migration in China.

MOBILITY, IDEOLOGY & SCALE

People and things are moving all over the world at all scales: moving hands, running away, commuting to work, immigration, etc. In the story of Chinese migrant workers, forms of mobility also appear at dramatically different scales. They may seem to be unrelated at first glance, but, if digging deeper, the meaning behind often connects and allows mobility to jump scales.

This thesis looks at the issue of migrant mobility at different scales. It starts from the country map, showing the massive movement of hundreds of millions of migrants crossing the surface of China. Research then zooms into a mega-city Shanghai, where distribution of migrants follows specific social and spatial pattern. It continues zooming in to a migrant populated district, Minhang, to understand migrant settlement location in relation to land value and public transit accessibility. Finally, it focus on one street, the cross section of which expresses the immobility migrants currently experience, and calls for architectural reimagination and urban reterritorialization.

As products and producers of power, mobility of migrant workers at all these scales could empower them to move beyond their territory.



MOBILITY VS IMMOBILITY

Mobility correlates to immobility. While the mobility of massive rural-to-urban migrants are restructuring social partition as migration policy opens up in the past two decades, it triggers a series of immobility that organizes and partitions their destination cities.

Institutional Barrier

Initially set up in 1951, *Hukou* (household registration) was largely adopted as a monitoring mechanism of population movements in the 50s. However, as influxes of peasants escalated in 80s, *Hukou*, through a system of migration permits and recruitment certificates, became a control mechanism that has since then played an important role in regulating population distribution and mobility(Chan and Zhang, 1999).

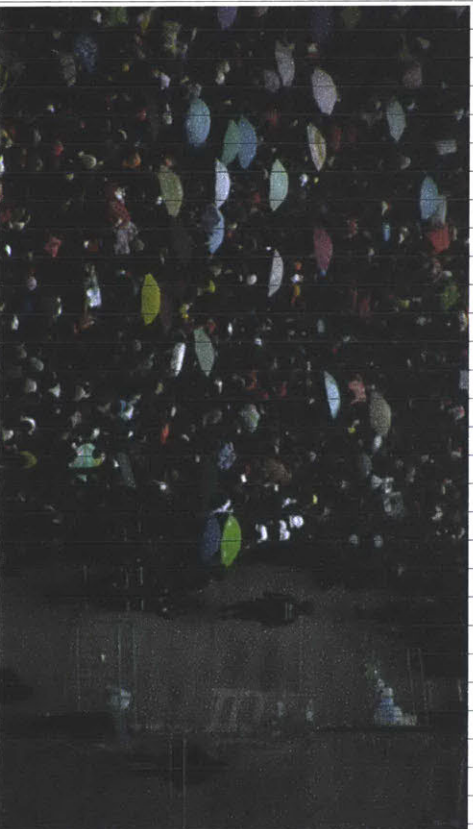
Two primary types of *Hukou* registration-peasant and non-peasant-emphasize the rural-urban divide. This distinction arose from a period in history when industry development was viewed as the priority so the state provided welfare to urban residents in priority-industrial sectors, while leaving the rest large rural population outside state support. Policies has changed over the years, but this close link to state-provided benefits and opportunities still perpetuate(Murphy, 2009).

In recent years, continuous efforts have been made by government to adjust *Hukou* to fit the changing political-economic system. There is a trend of loosening this strata-entrenching institutional system, yet more need to be overcome.

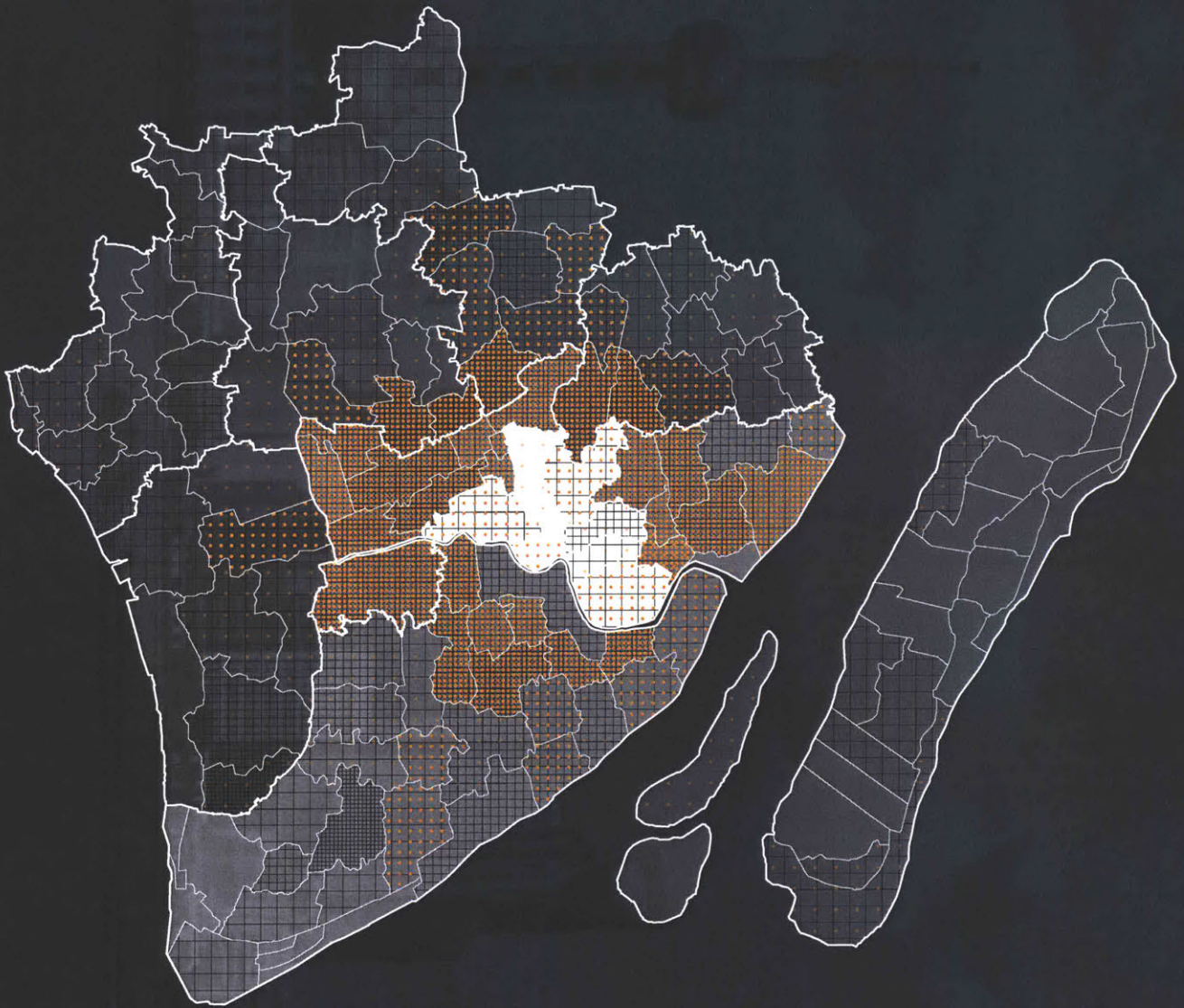
Social Barriers

Many social factors exclude migrants from becoming members of urban society. The term '*nong-mingong*', or 'peasant workers', is a term commonly called by urban residents. It associates migrants with two identities: peasants from the rural land and laboring workers in the urban setting. It reinforces their place of origin and their purpose in the city as hard laborers required for the operation of giant urban machine. Another term '*disuzhi*' or 'inferior quality' frequently appear in descriptions of migrants. It is an urban critique of migrants' lack of education and their supposed poor upbringing due to their poverty and substandard school facilities(Wallis, 2013). These urban prejudices lead to further immobility in migrants' social life.

Lack of social bonding between migrant workers is another social barrier within themselves. Due to their long working hours and rootless living and working style, migrants often found friendship hard to develop and maintain in their migrating cities as revealed in migrant surveys conducted in Shanghai(2012).



images from migrant documentary *Last Train Home*



SHANGHAI | MIGRANT SETTLEMENTS AND SOCIAL PARTITION

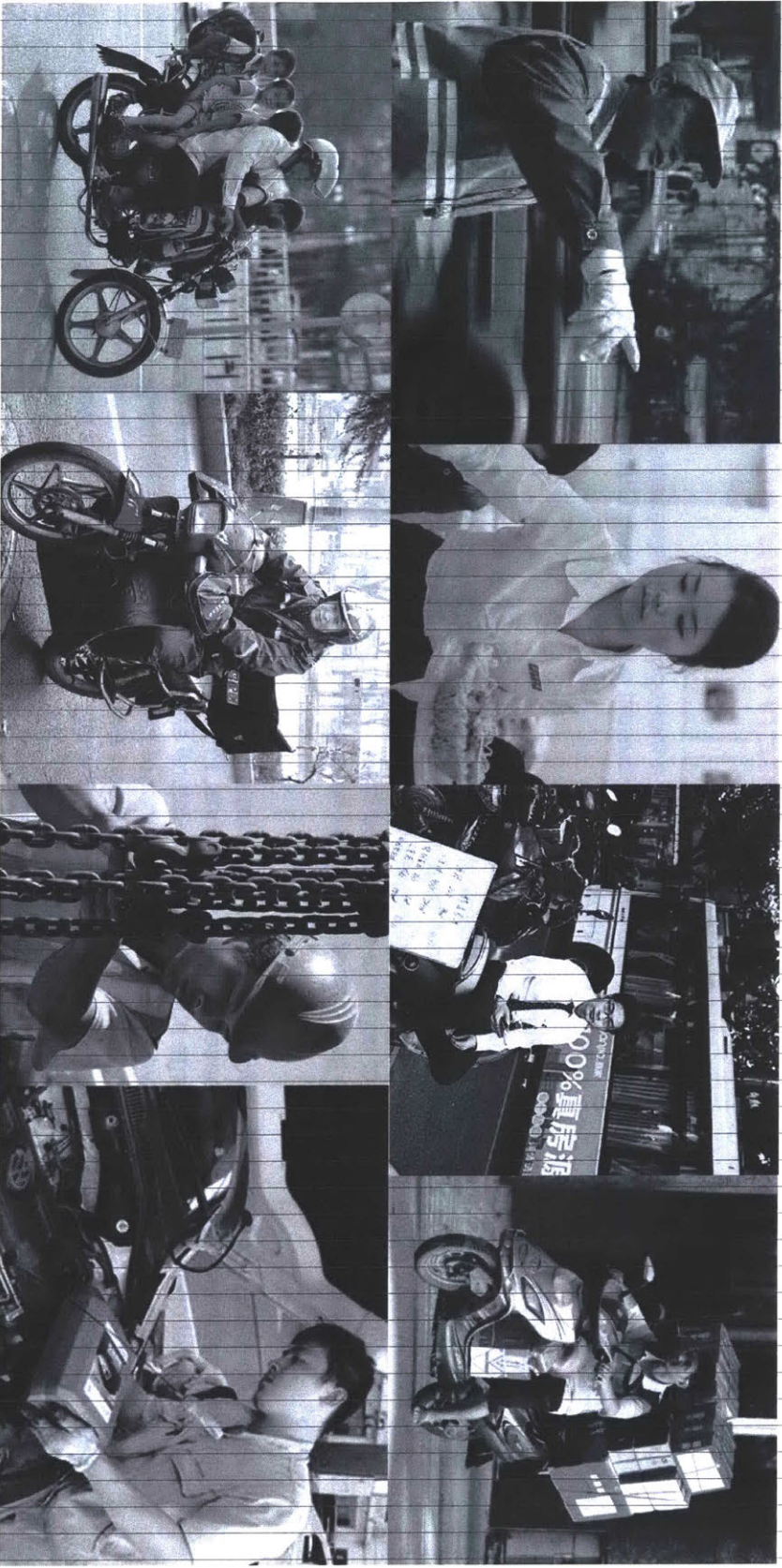
Located on the mouth of Yangtze River Delta, Shanghai is a metropolis that represents the booming cotemporary Chinese city. It is a global financial center and also world's busiest container port. Out of its total 20.6 million population, 5.4 million are migrants (Shanghai Yearbook, 2015).

SPATIAL PARTITION - Center vs Periphery

Geographically, Shanghai could be divided into three rings: central city, inner suburbs and outer suburbs. Despite government's continuous efforts in socioeconomic development, disparities between city core and urban fringe is still prominent. While inner-city slums used to host large number of rural-to-urban migrants, as redevelopment of urban core rapidly took place, peripheral migrant aggregation became dominant (Wu, 2005). A map of migrant distribution in Shanghai shows that majority of migrants are located in the urban periphery, in district of *Minhang*, *Baoshan* and *Pudong*, especially in rural-urban transitional areas that have gone through tremendous changes in the recent ten years.

EMPLOYMENT PARTITION - informal jobs in labor intensive sectors

Migrant settlements are formed based on various reasons. Proximity to potential employment in a major determinant in their locational choices. The large number of infrastructural and real-estate construction work in inner suburbs that requires massive labor forces have attracted large number of migrants to settle nearby. Large industrial plants as well as small-to-medium manufacturing companies also gathered a huge migrant population there. Recently, demand of labor in service sector, like catering, package delivery, household cleaning, increased as well since population rose up and needs escalated (Minhang Yearbook, 2015). Number of employment opportunities rose up and down dramatically overtime, and informality characterizes most of these jobs.



1.5 MILLION
OUT OF
2.5 MILLION
PEOPLE IN MINHANG ARE
MIGRANT WORKERS

Minhang Migrant worker employment statistics



My name is Li and I started working as
an auto mechanic

In Minhang a year ago. Everyday, I woke up at 7:00 and ride my scooter to the shop. Boss asks us to get there early for morning assembly, to go through safety issues and do daily checks. My job involves a lot of physical labor - polish cars over and over again and wash cars one by one - thus we have **two-hour lunch break** everyday. Sometimes, **I wish I could ride around in Minhang** in one of the cars I washed (with some music on, along the river bank!). I never get the chance to explore Minhang since my work often finishes around 8pm. Winter is chilly here especially in early morning and late night. That's why I got a **scooter wind shield**. It covers from my mouth to my toe. A lot of us get it to shield wind and dust.

Manufacture
292,000 ppl
RMB 3,300 /mo



My name is Wei, and I've been working in Minhang as
a fruit dealer

For 5 years, I started using scooter right after I began my fruit business. It's very handy, got me around places very fast, especially when the traffic is heavy. I need to meet business partners normally. Most of them are in Minhang as well, at locations on and off the public traffic lines, but with scooter, no location is inaccessible. Sometimes, I even use scooter to carry fruits if the amount is not that many. I have a mini van, but I don't use it as often as my scooter.

Wholesale and Retail
67,700 ppl
RMB 3,600 /mo



My name is Hua, and I've been working in Minhang as
a road construction worker

For 7 years, about 330 km of highway was constructed in Minhang in the past ten years, that is more than 15 times the length of this district. (Almost the distance from Shanghai to my hometown). I am proud of what we've built, though my life doesn't benefit much from them; they designed are for those who have cars and live in big houses, not for us who ride scooters daily. I have a **two-year old** at home. Picking up my boy at kindergarten and giving him a scooter ride always make him happy and make me happy.

Construction
64,300 ppl
RMB 2,700 /mo



a food deliverer.

My customers are usually **college students and white-collar workers**. I visit office towers and school dorms everyday but have no time to stop for a second to take a look since orders keep coming up. My **busiest time is during lunch and dinner**. Food orders can drive me from place to place non-stop for 2+ hours. Usually traffic is bad during those time, but my **scooter is agile enough** to navigate through the traffic. My life centers around my scooter, my cellphone, and my insulated food box.

Accommodation & Catering
22,000 ppl
RMB 2,500 /mo



My name is Mei, and I am
a housing agent

In Minhang District, riding around with scooter to **check houses** and helping customers to find the right one for them has been my job since 2012. **Ten visits per day** is the average amount, and over 80% of time, I am on my scooter. Sometimes, I ride customers to visit houses too. I added a **scooter umbrella** to **shed rain and sun**, making my daily routine rides protected from bad weather. My customers like it too.

Real Estate
14,600 ppl
RMB 2,800 /mo



scooter 10 mins ride circle

- rental housing cluster
- 0-500 RMB/mo
- 500-1000 RMB/mo
- 1000-2000 RMB/mo
- 30000 RMB/m²
- 40000 RMB/m²
- 50000 RMB/m²
- 60000 RMB/m²
- rapid urban transit lines
- future rapid urban transit lines
- area of 10 min ride by scooter from urban transit lines

MINHANG | SCOOTER AS A NEW MODE OF MOBILITY

As the earliest migrant aggregated district, *Minhang* has accumulated large number of migrants since the early 2000s. Initially attracted by numerous manufacturing plants here, migrants flooded in as demand for labor continue to rise. More recently, rapid real estate development along the light-rail line also bring large number of migrants to the related service industry. Out of its total 2.5 million population, 1.5 million people in *Minhang* district are migrants(Minhang Yearbook, 2015).

RAPID PUBLIC TRANSIT & LAND VALUE

While density of metro stations in central city is based on walking distance, as metro goes to suburbs, its density drops sharply since it's no longer an overlapping network system but a spine flying across a vast land. Land use responds accordingly. Along the metro lines, one would frequently spot high rise residential neighborhood and commercial streets that are both of high land value, whereas industrial complex, factories and storage space clustered further away. Mapping of average subdistrict housing price in *Minhang* reveals similar trend (Lianjia.com, 2016).

ON / OFF LINE

The insanely high housing price in Shanghai drives migrants to live far away from light-rail lines. Often, they live in an unsettled manner - staying in rental home and annually moving from one to another to avoid rising rents is a common practice. Data collected from housing rental website(Fang.com, 2016) also shows that majority of rental home affordable to migrants are rather far from light-rail line so rapid public transit is not accessible to them on foot. However, they are all in the reach of scooter, a personal vehicle very popular among migrants.

SCOOTER IS RISING UPI

Electric-powered scooter is a special phenomenon in contemporary China. Thanks to technology breakthroughs in the early 90s, scooter emerged as an affordable personal vehicle and gained unmatched popularity in the past 20 years. Its sales went from 150,000 in 1999 to 21 million in 2007, and recently reached 2 billion(APE, 2014).

FAST, CHEAP & FLEXIBLE

Such popularity is not coming from nowhere. While under state regulation, scooters couldn't exceed 20km/h speed limit, many users ride it at 30-40km/h, which is more than twice as fast as biking. On one charge, scooter can easily ride 20-25km(Ma, 2006). Moreover, its small size and flexible parts allow experienced riders to quickly maneuver through heavy traffic.

TRANSPORTATION + PRODUCTION

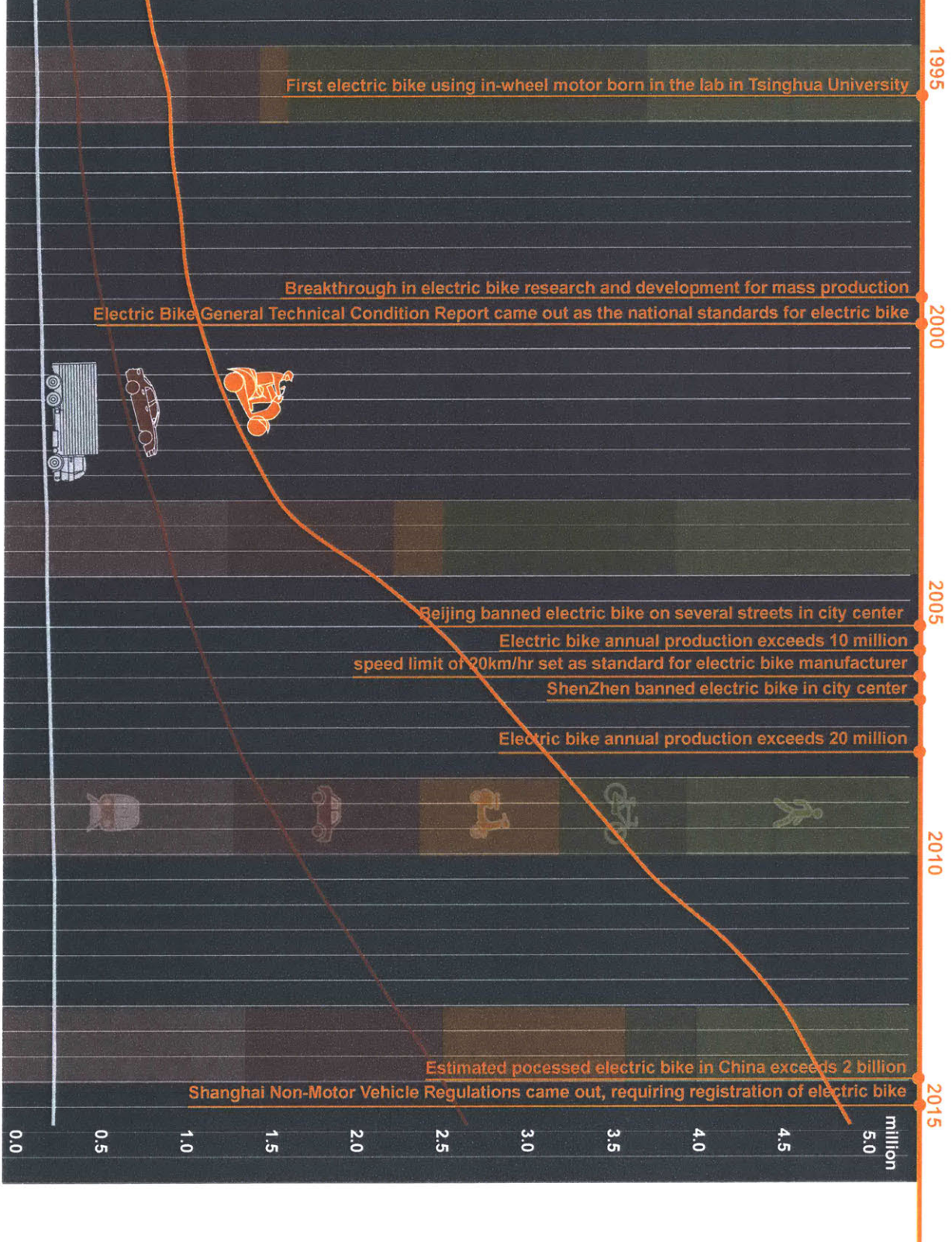
Scooter has been particularly popular among migrants in urban periphery. Living on a vast land without sufficient rapid public transit coverage and having informal jobs that may require constant trips across the area, migrants' life in urban periphery depends a lot on this fast and flexible personal vehicle. Many migrants use scooter not only as a means of transportation but also a means of production, as jobs like food deliverers, housing agents has rising employment number.

OPPORTUNISTIC IDENTITY

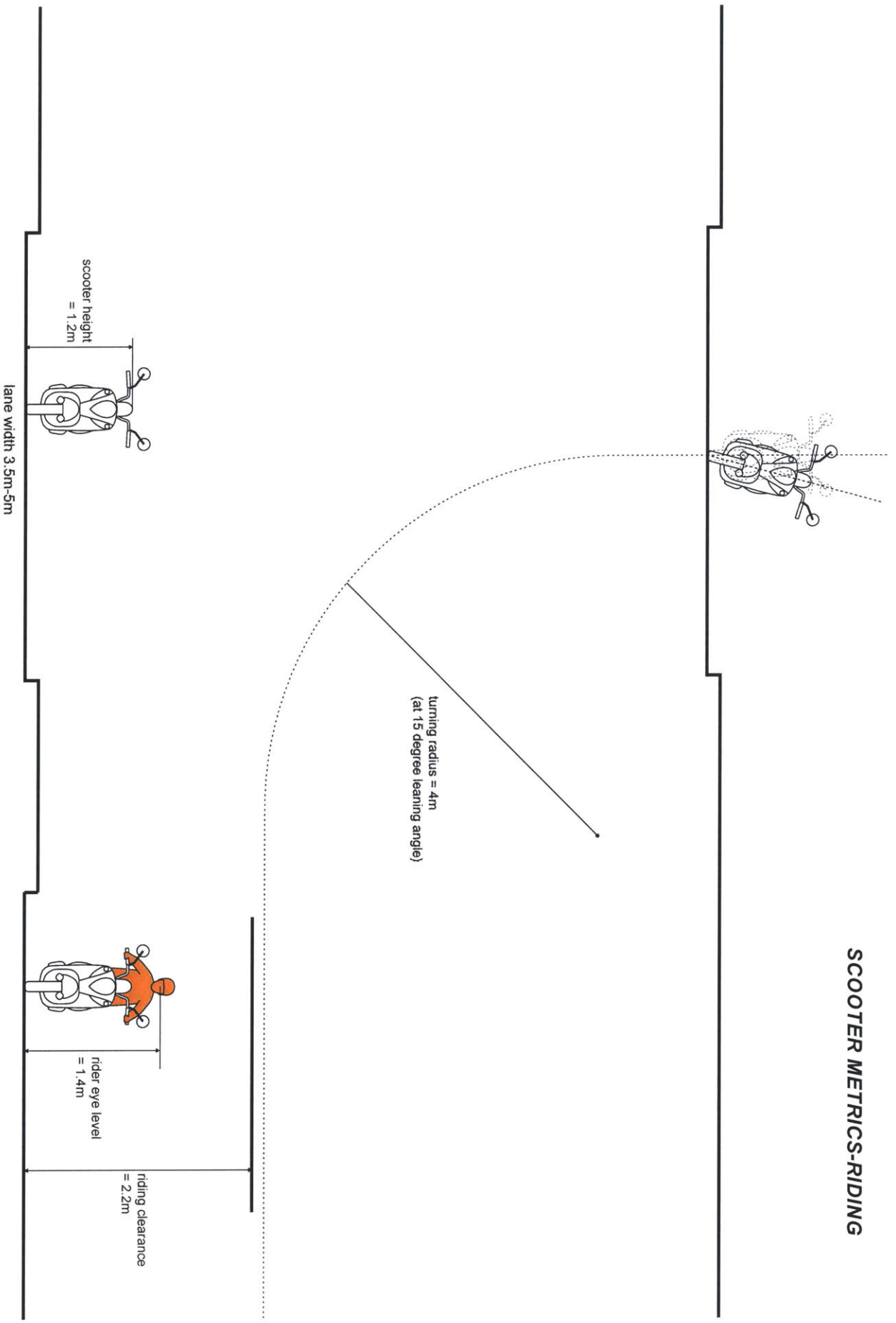
Many relate migrants to scooters because of their illegal riding moves and opportunistic characters: rushing through red light, riding in opposite directions, etc. Major city like Beijing and Shenzhen banned scooter in certain central region. Despite these suppression, scooter continued to flourish in urban periphery and became an identifier of migrant workers.

Shanghai vehicle statistics

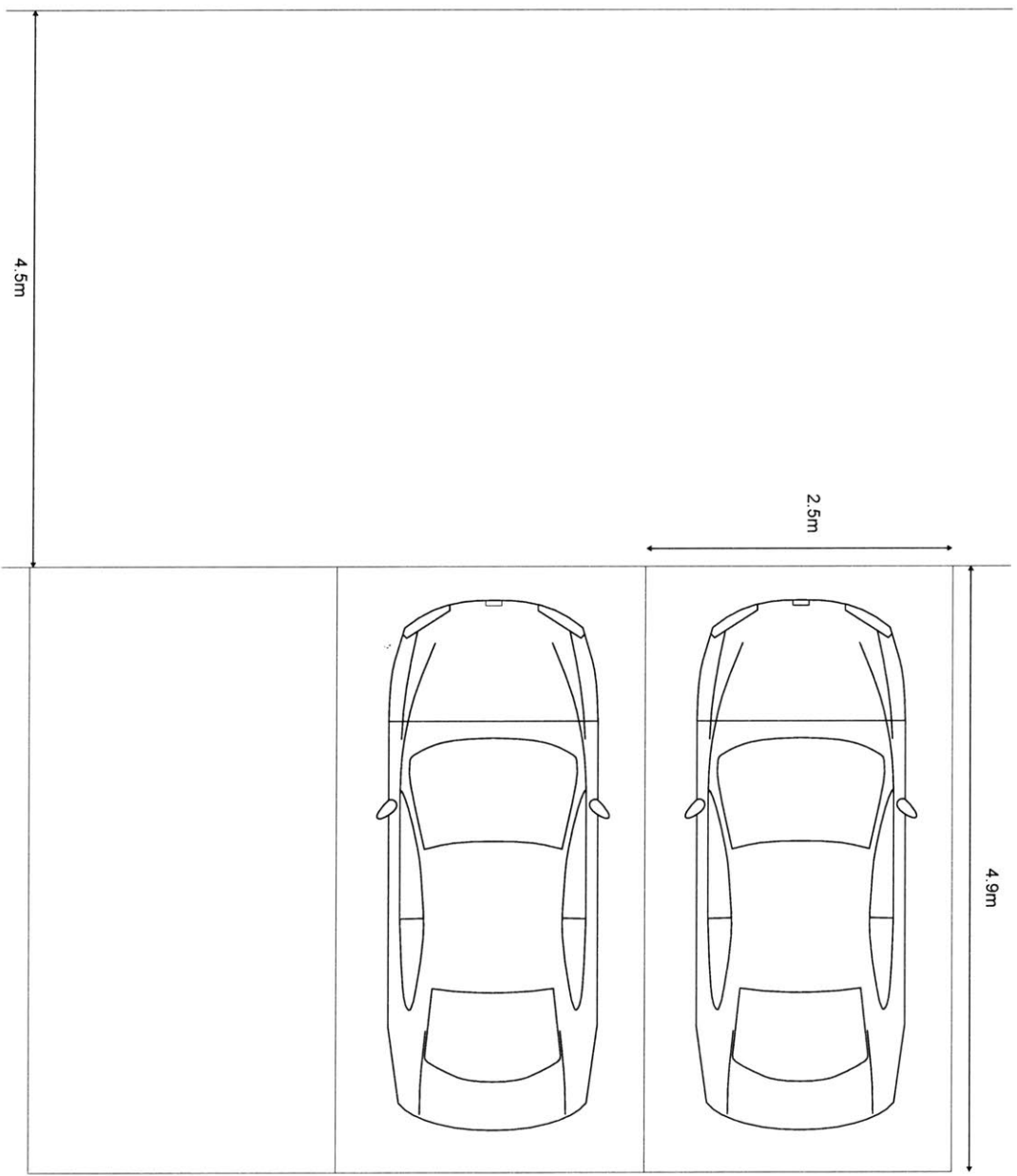
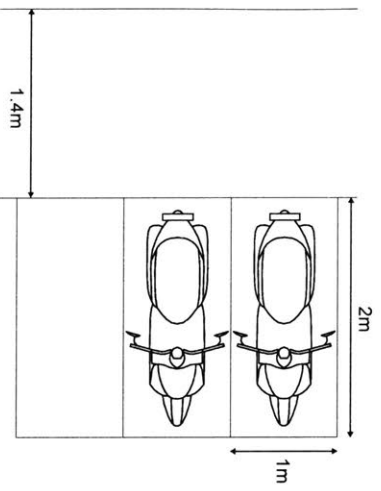
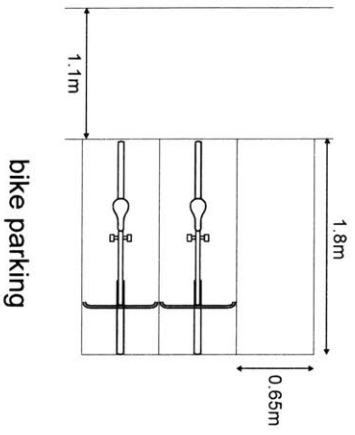
Shanghai transportation habit survey



SCOOTER METRICS-RIDING



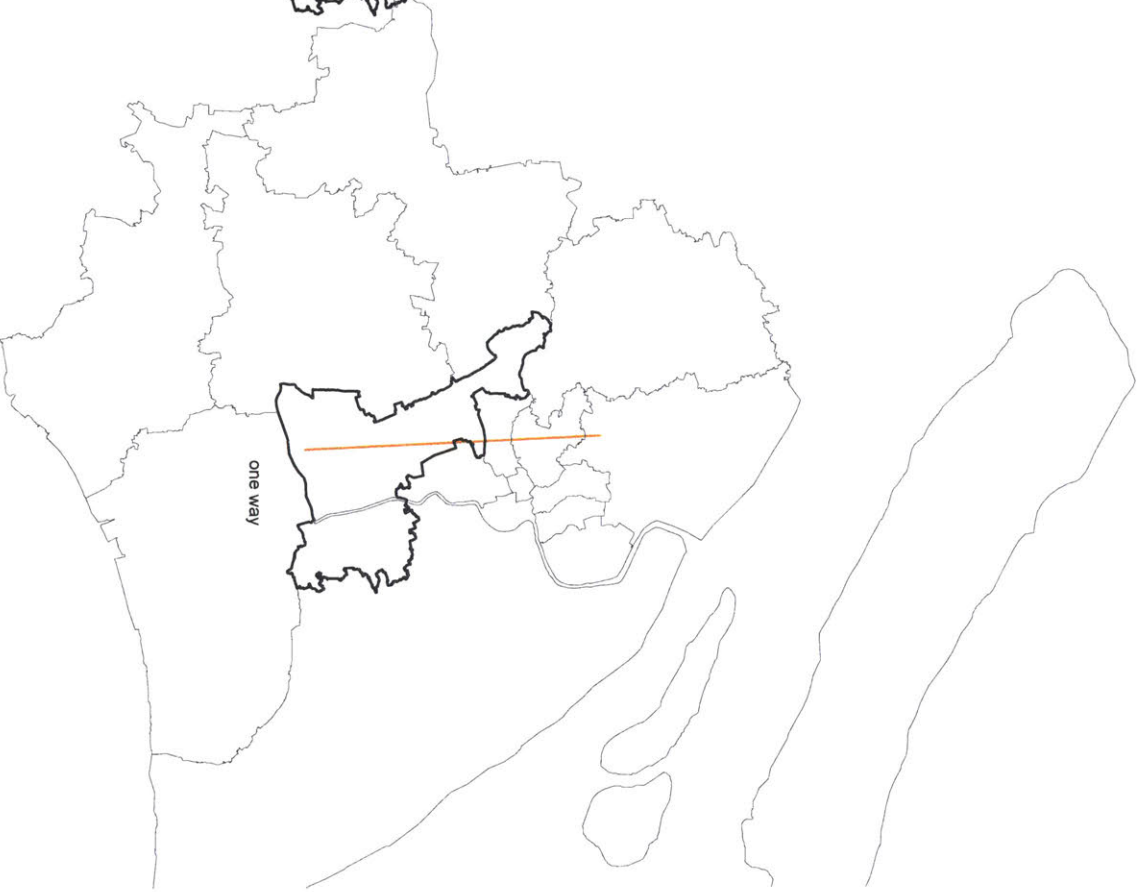
SCOOTER METRICS-PARKING



SCOOTER METRICS-TRAVELING



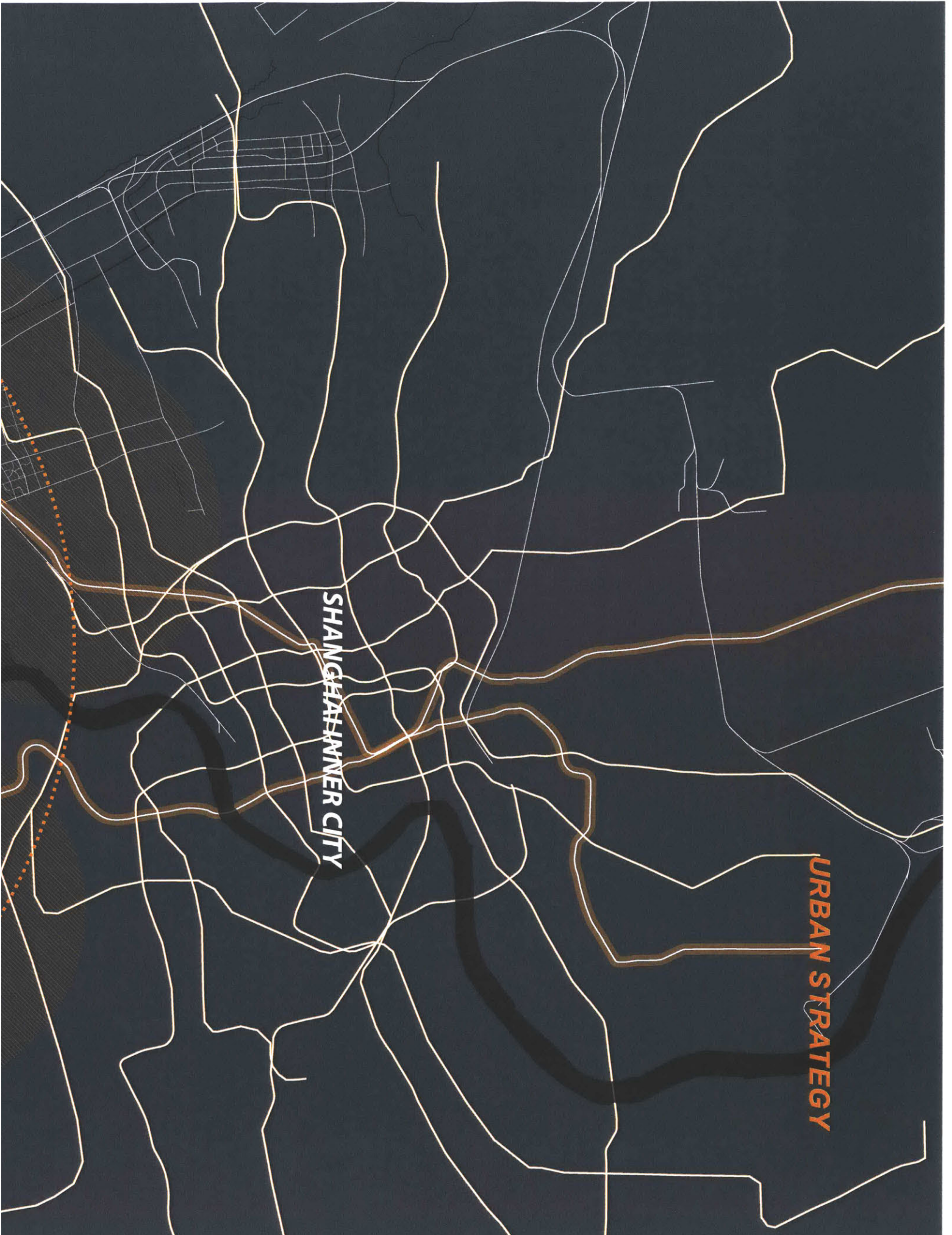
battery lasts for about 1.5 hrs or 30km
full battery recharge needs about 8 hrs
battery life space is about 4 yrs



DESIGN

URBAN STRATEGY

SHANGHAI HAMMER CITY

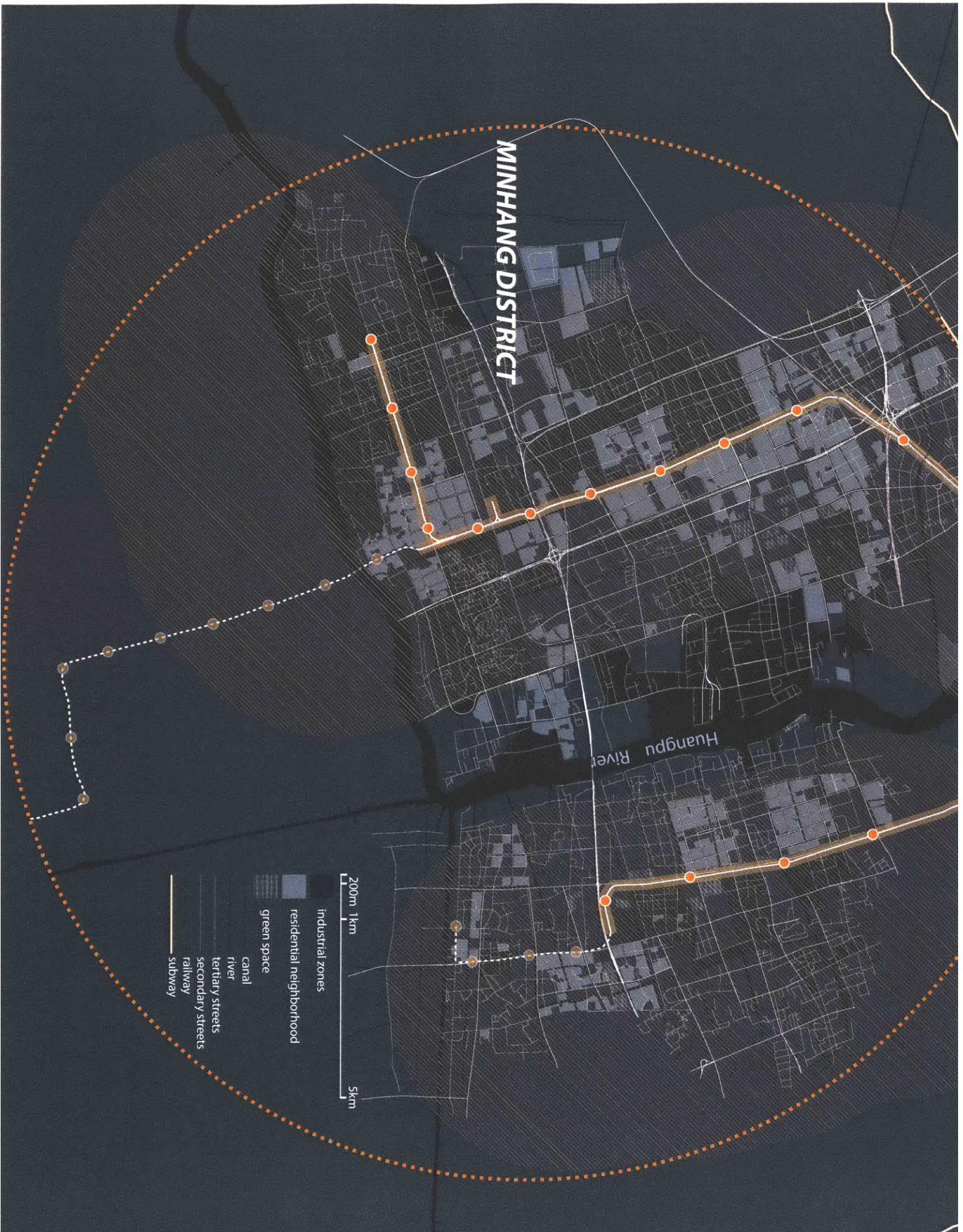


MINHANG DISTRICT

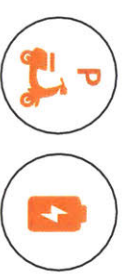
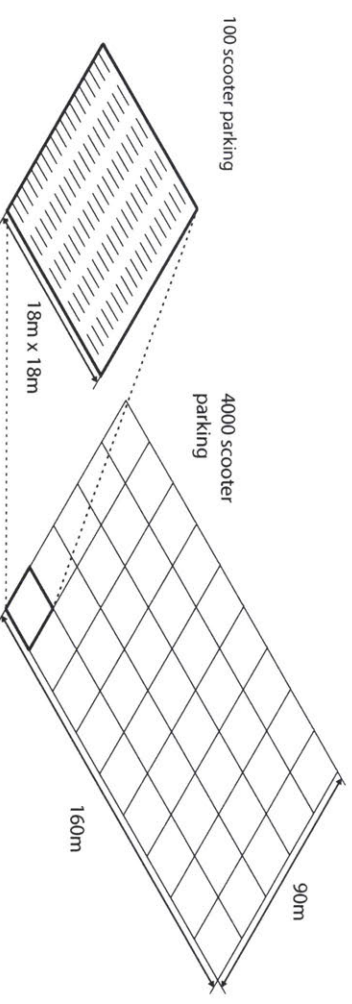
Huangpu River

200m 1km 5km

- industrial zones
- residential neighborhood
- green space
- canal
- river
- tertiary streets
- secondary streets
- railway
- subway



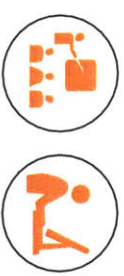
Based on **1.5 million** migrants and **20 lightrail stations** in Minhang, for **5%** of local migrants to take lightrail to go to city center, each station should have **4000+** scooter parking



scooter parking & charging



job exchange & printing station

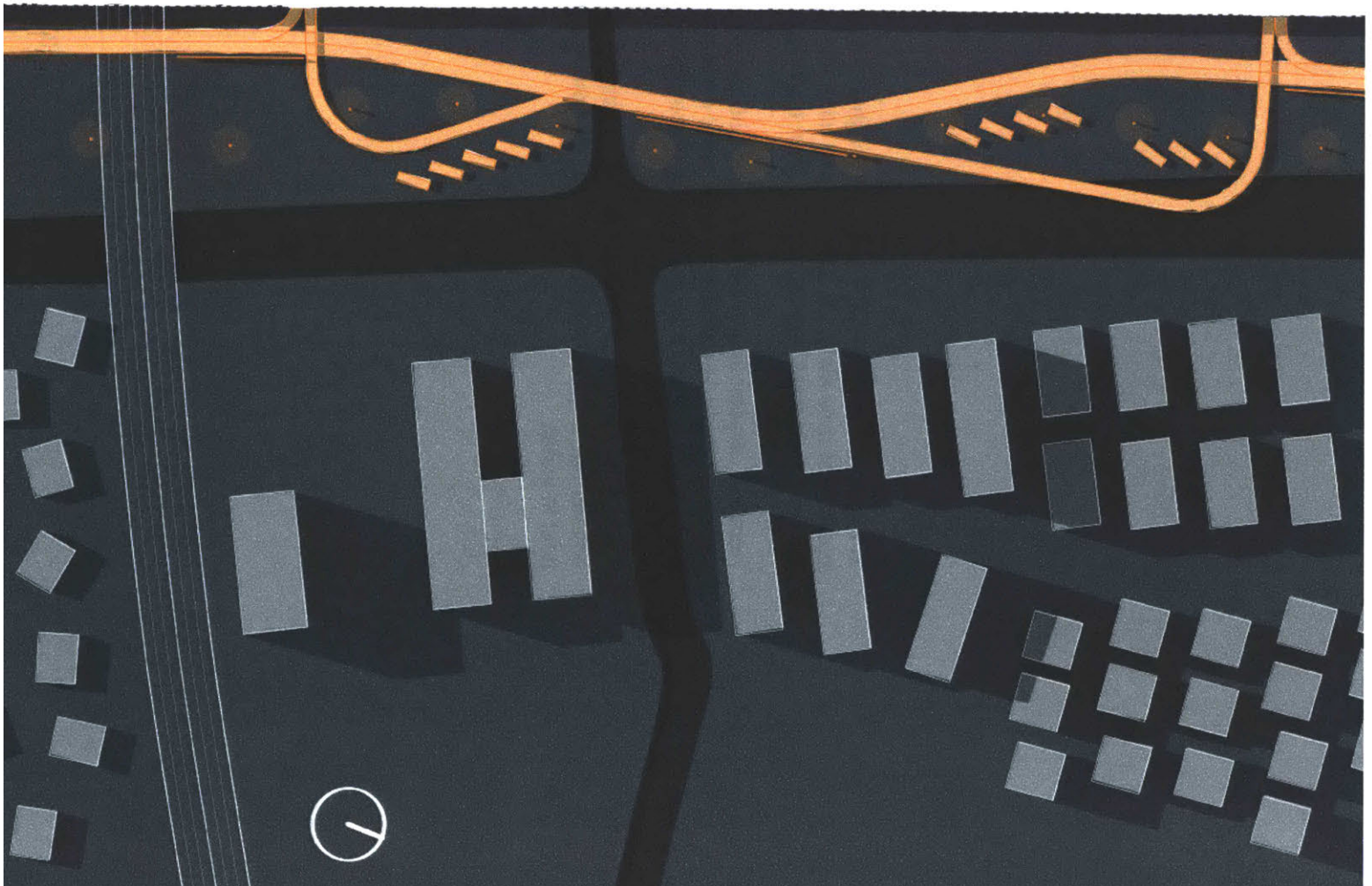
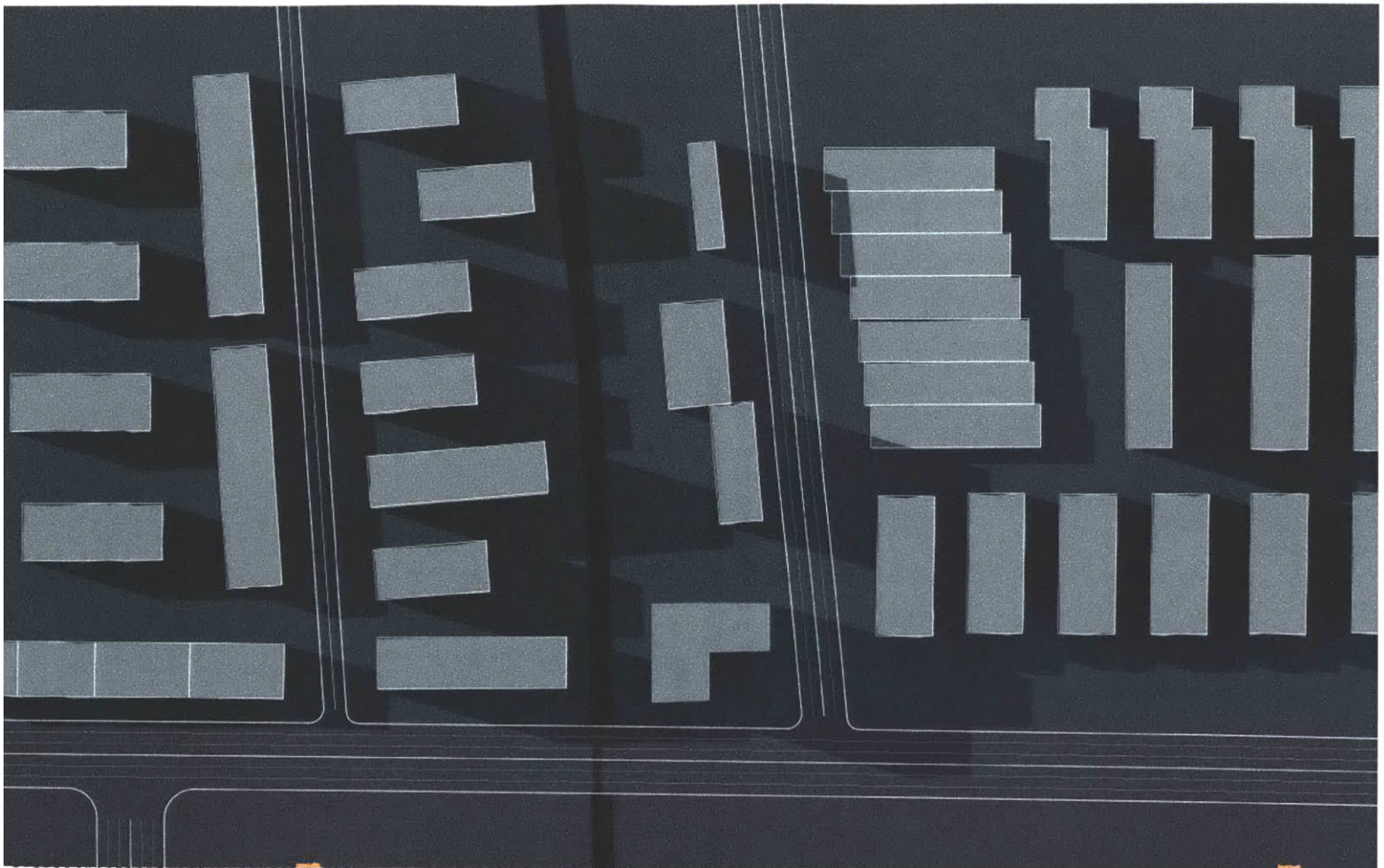


night school & computer cluster

To empower migrants with greater mobility and access to the city, this design proposes scooter parking garage at each subway station in *Minhang* District. In addition to scooter parking, education and job/info exchange program are included in the design. It aims to create migrant hotspots along the light-rail line—a high land value area where migrants don't normal belong to—to reterritorialize existing social and spatial partitions.



SITE PLAN

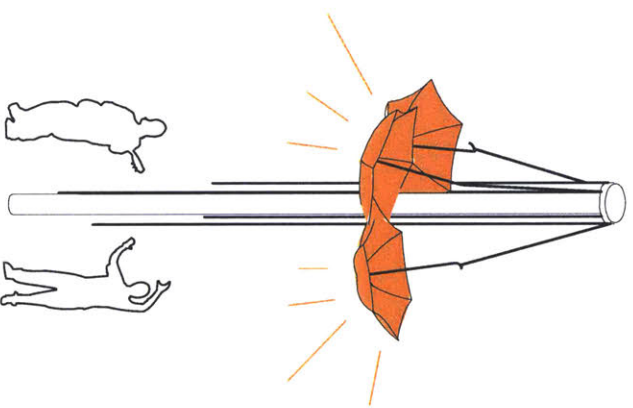
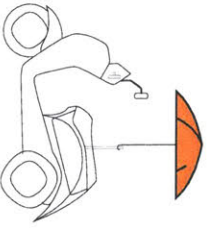


In addition to parking garages at each light-rail station, this design also proposes a riverside promenade that runs along the light-rail and connects all garages. It utilizes the barren land underneath elevated train track and adjacent to river to create alternative scenery paths for scooter riders.

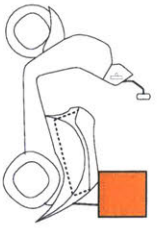
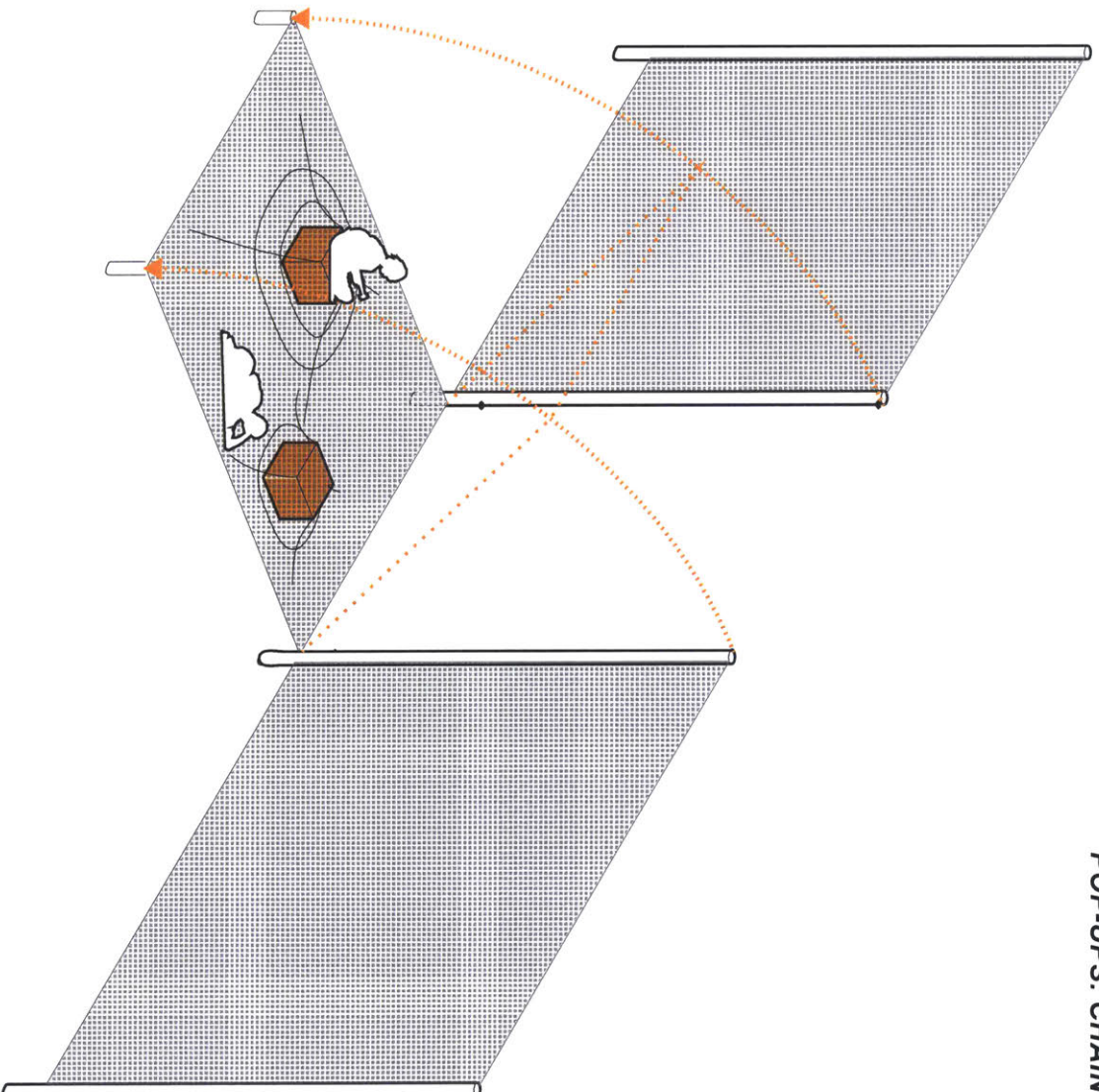
Norms of streetscape in *Mirhang*, such as streetlights, fences, and shipping containers, are redesigned. They can be activated by scooter carry-ons, such as shading umbrella, food delivery boxes, etc., and be transformed into pop-up places for various migrant activities.

T and + traffic intersections were studied as formal precedents for riverside promenade. It allows scooter paths to branch off to two sides, connecting to activity space underneath train track and next to water.

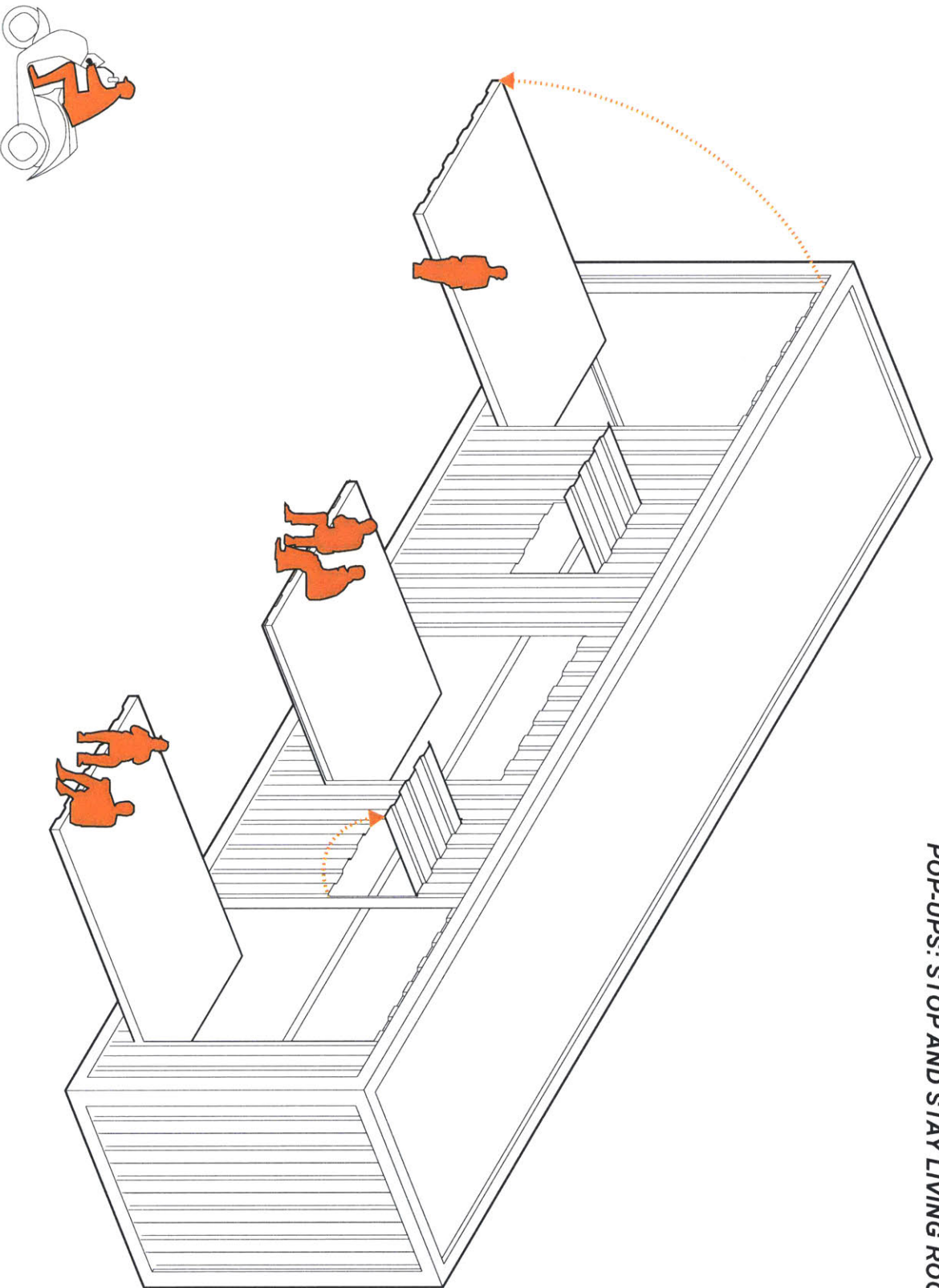
POP-UPS: STREET LIGHT KARAOKE



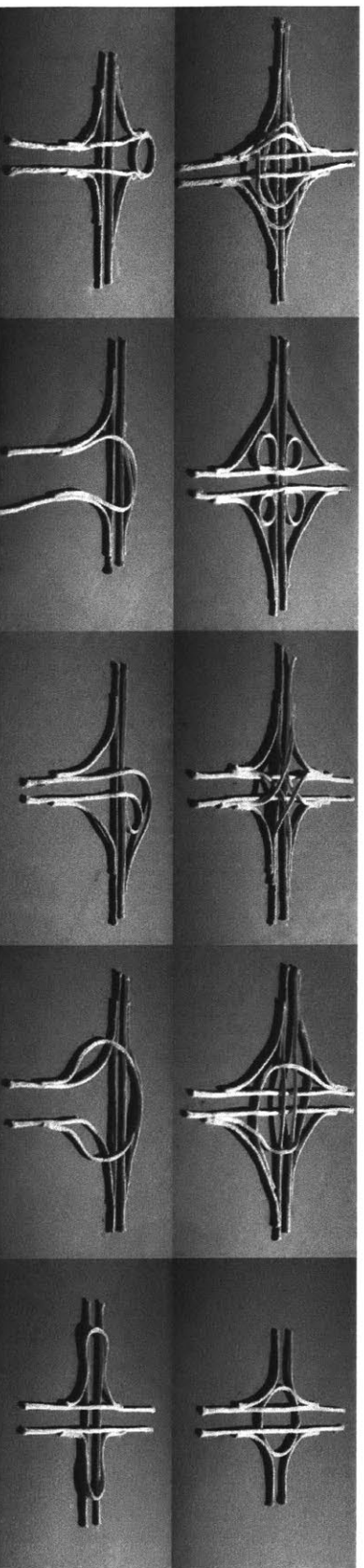
POP-UPS: CHAIN-LINK MAT



POP-UPS: STOP AND STAY LIVING ROOM



TRAFFIC INTERSECTION TYPOLOGY STUDY



turbine

cloverleaf

stack

turbine-stack hybrid

roundabout

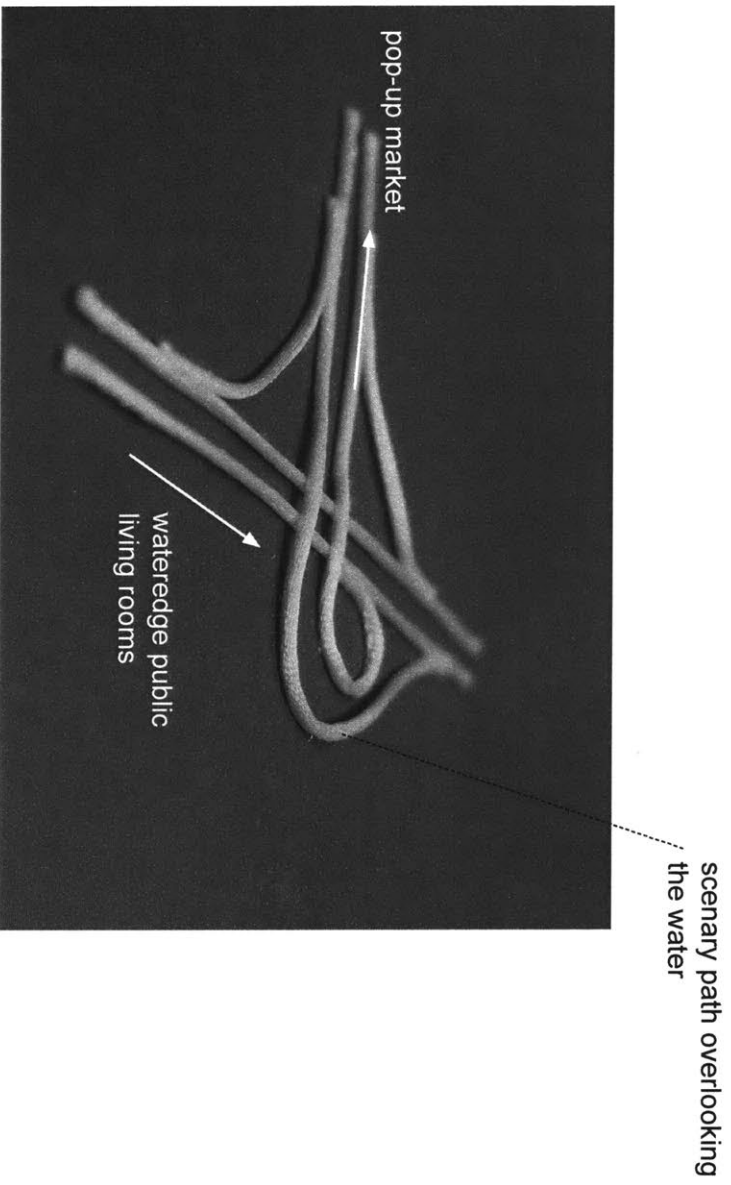
roundabout T

T-bone

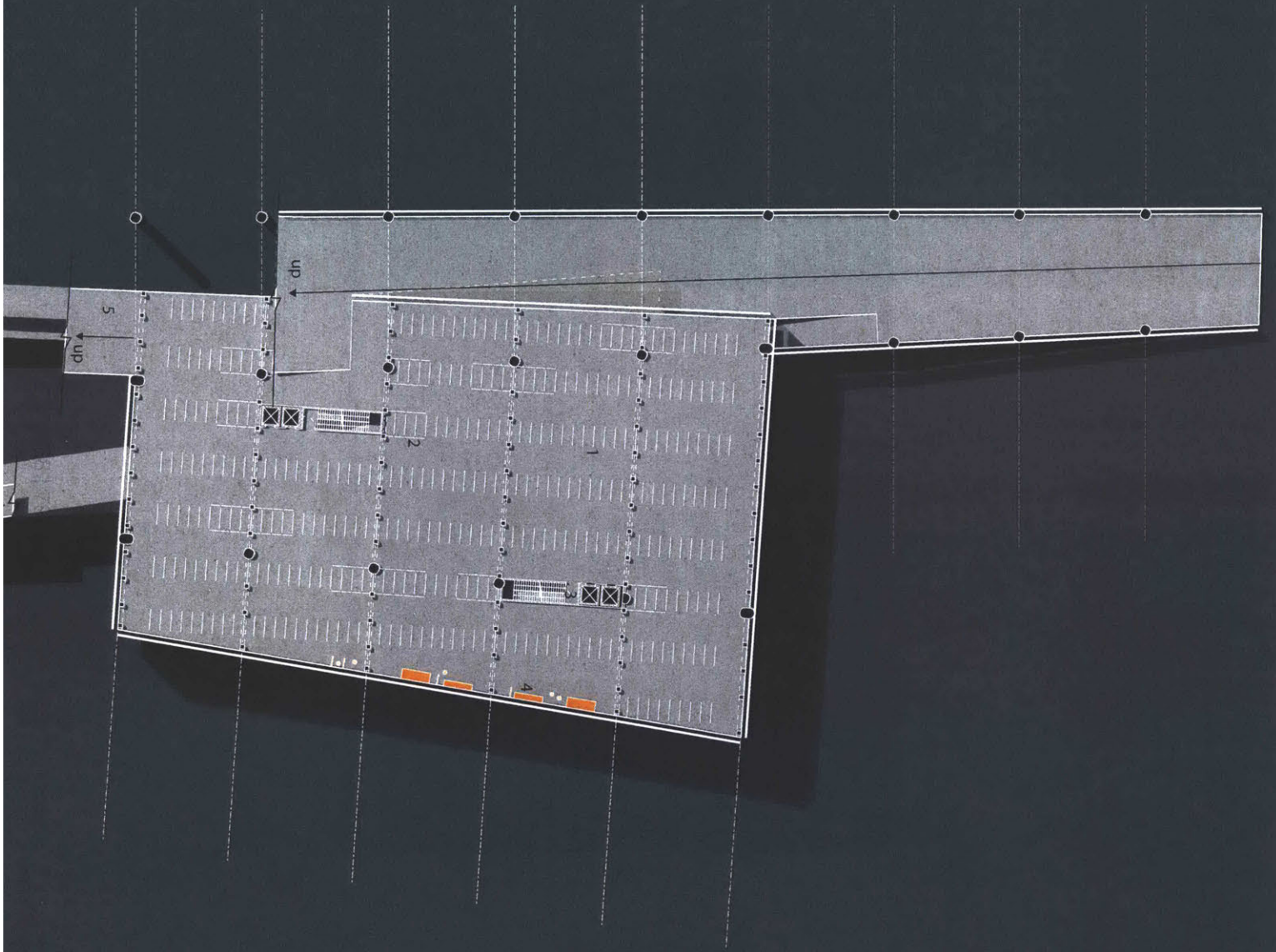
trumpet

semi-directional T

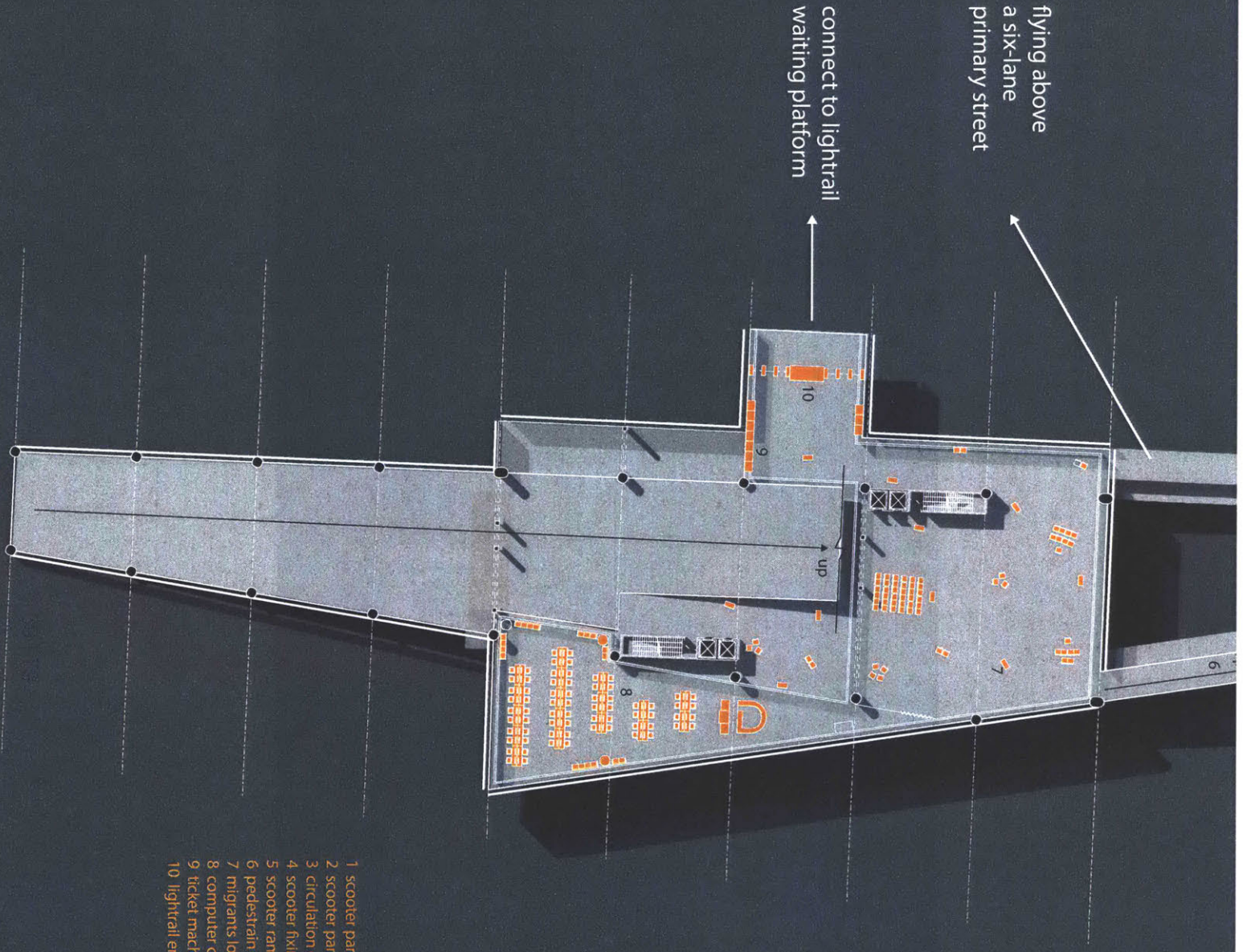
U-turn



Trumpet is chosen as the intersection type for scooter riverside promenade

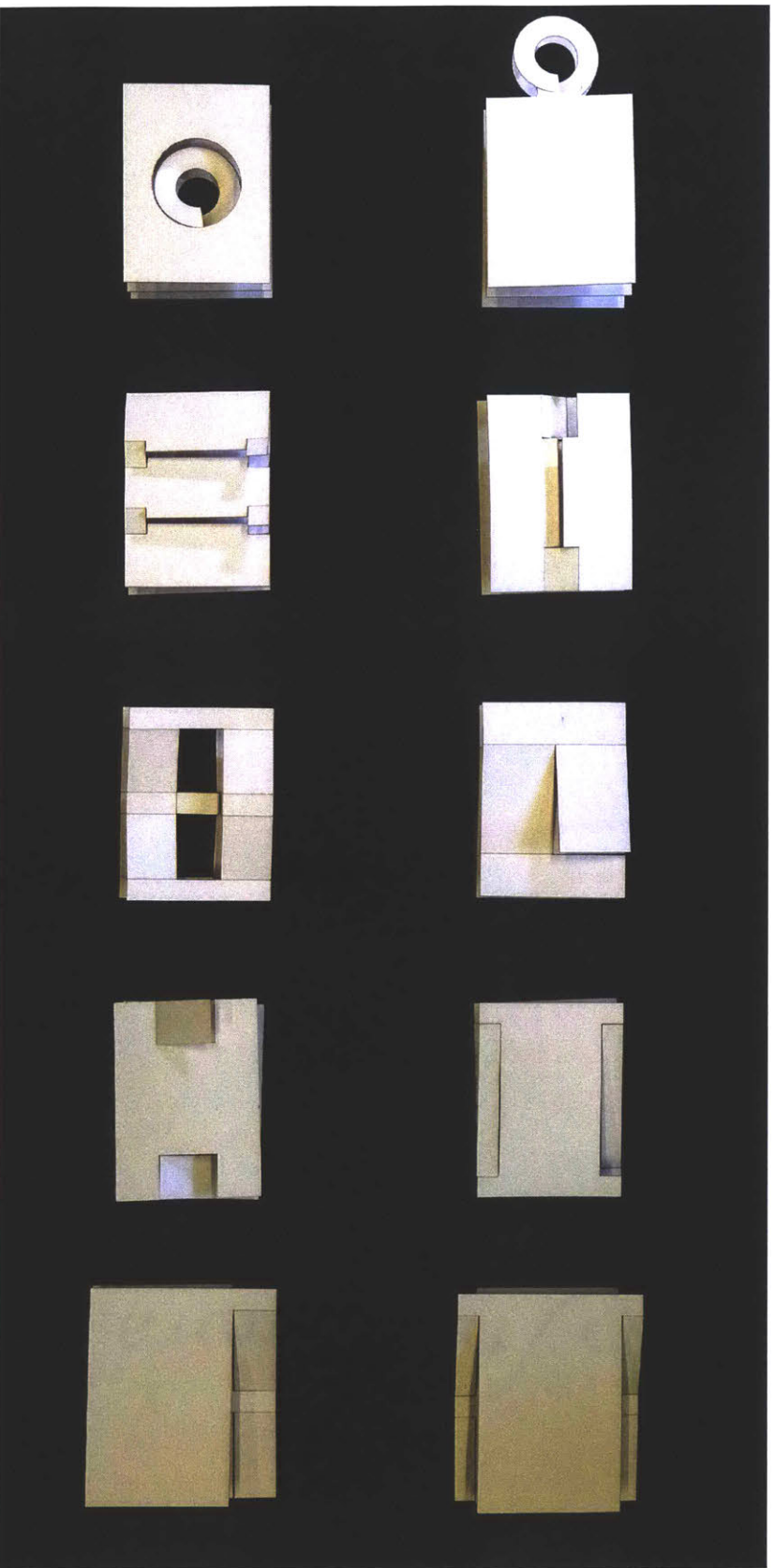


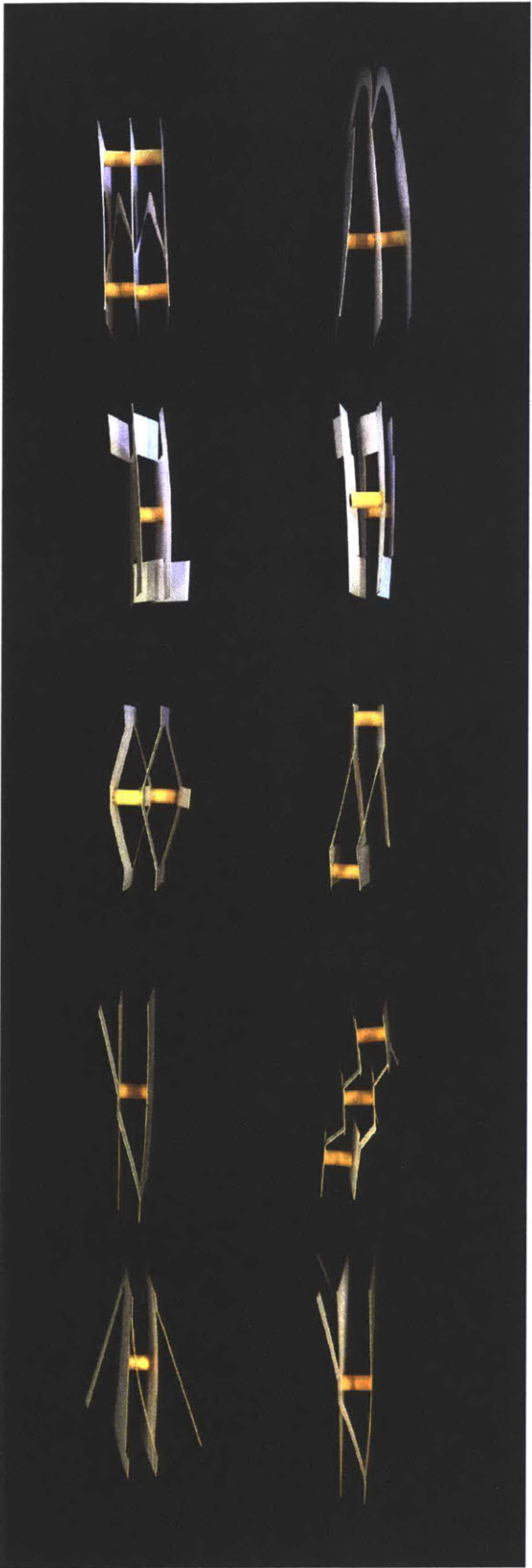
PLAN



- 1 scooter parking (regular)
- 2 scooter parking (with charging outlets)
- 3 circulation core
- 4 scooter fixing station
- 5 scooter ramps
- 6 pedestrian ramps
- 7 migrants lobby with self arranged benches and stands
- 8 computer cluster and printing station
- 9 ticket machine
- 10 lighttrail entry gates

PARKING GARAGE TYPOLOGY STUDY





helix
external, peripheral

split-level
conjunct, 2 level

continuous
conjunct

split-level
disjunct, 3 level

linear
disjunct, peripheral

helix
internal, conjunct

circular
conjunct, peripheral

continuous
conjunct, tandem

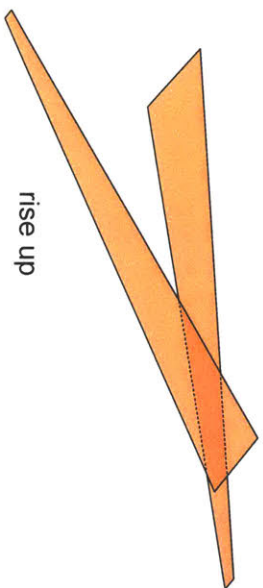
linear
conjunct, peripheral

circular
disjunct, peripheral

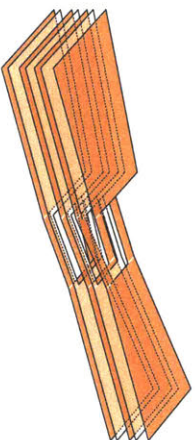


Split-level, conjunct is chosen as the garage type for parking design. It's stretched so the middle ramping part is being placed above a six-lane primary street, allowing scooters to cross the street as flying above flows of traffic.

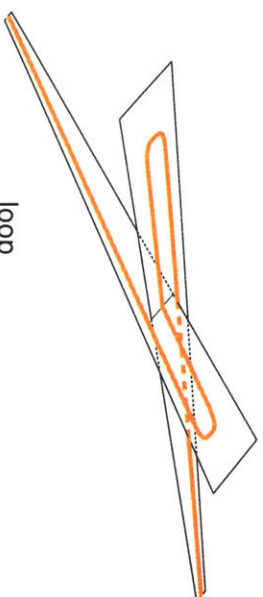
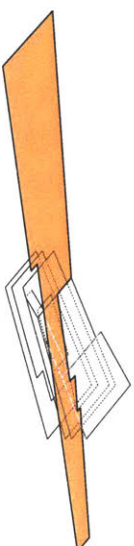
FORMAL DIAGRAM



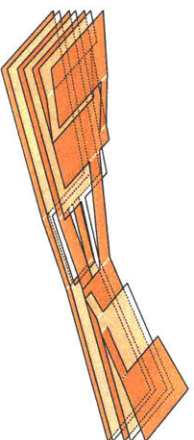
rise up



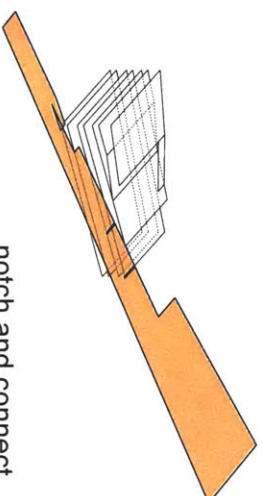
stack



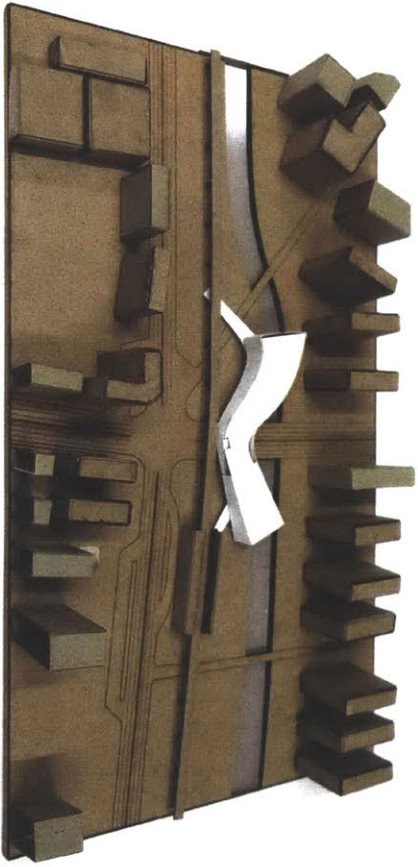
loop



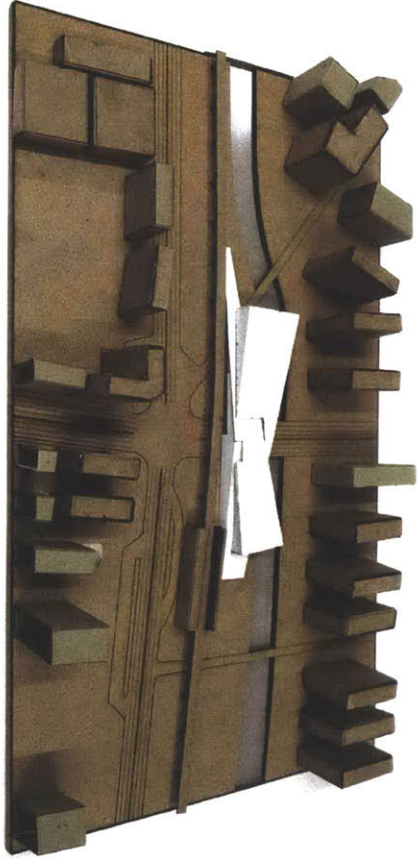
terrace



notch and connect



massing model 1



massing model 2



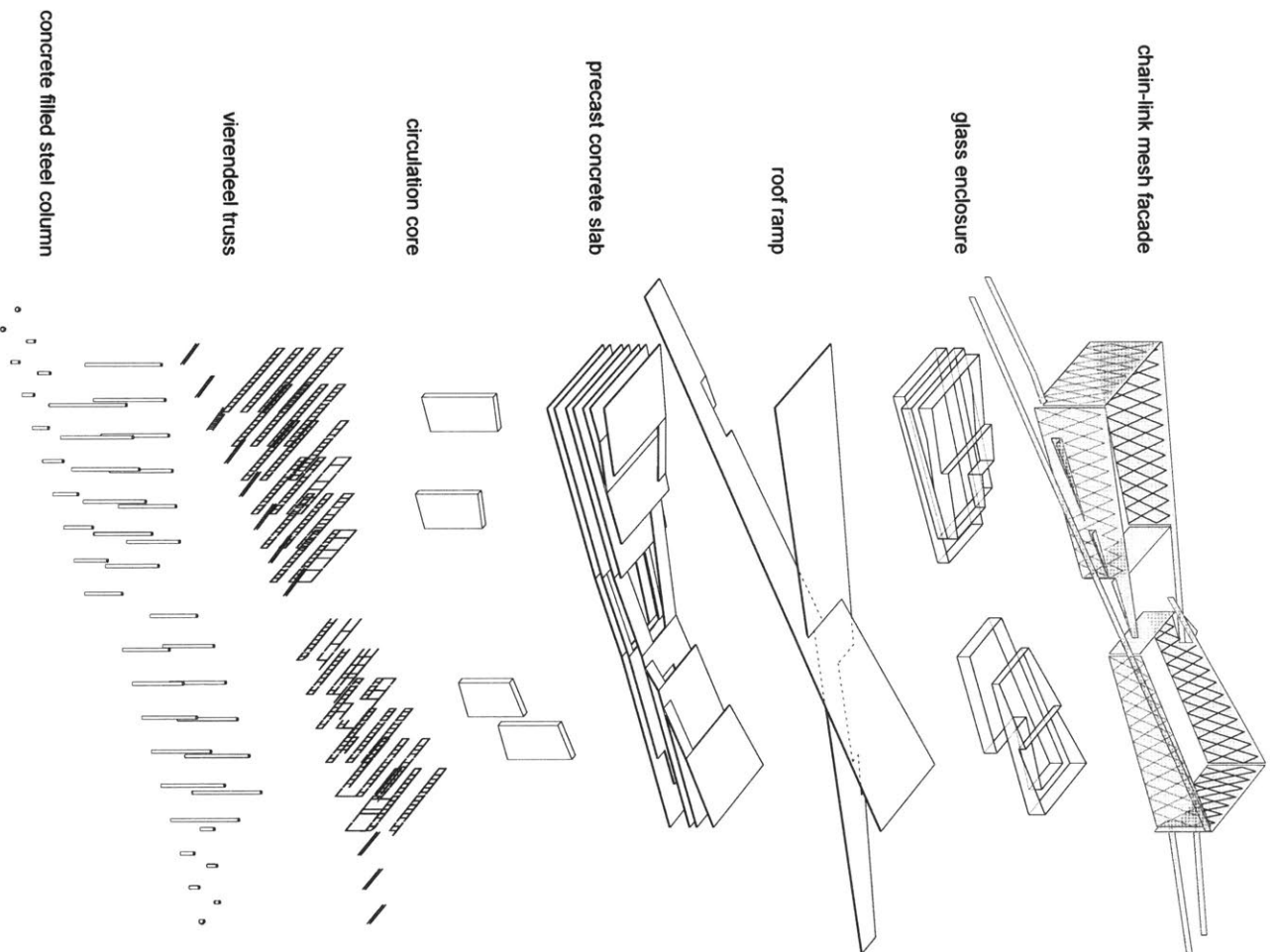


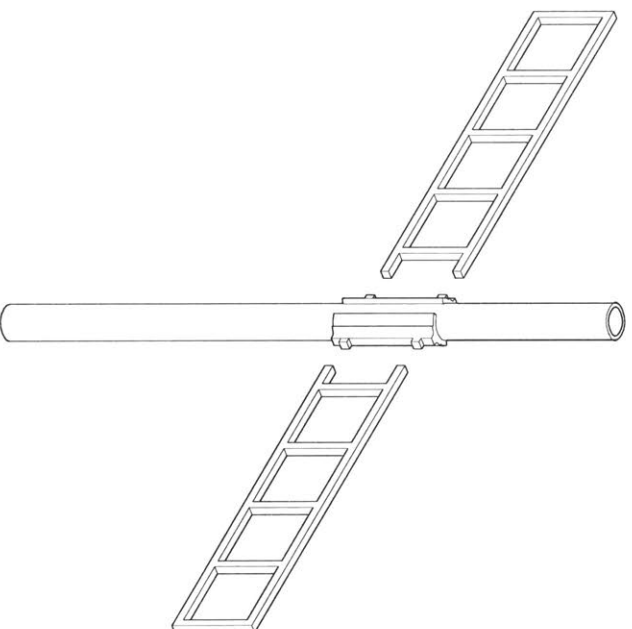




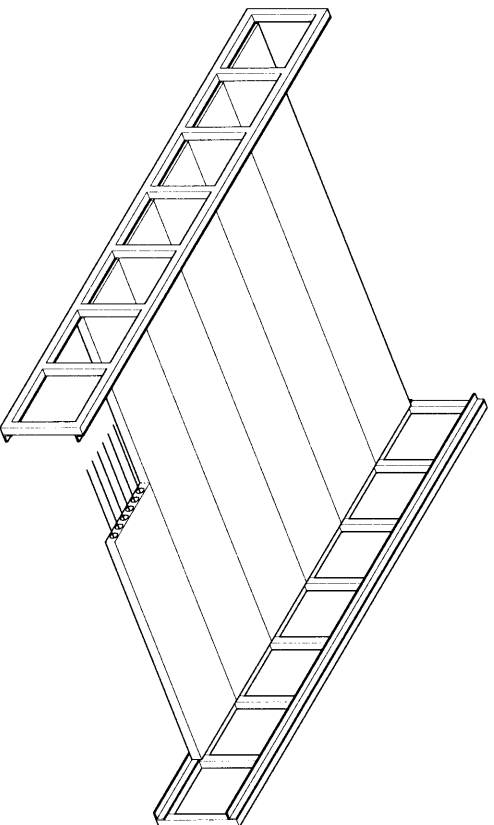
SECTION

**STRUCTURE SYSTEM
EXPLODED AXON**

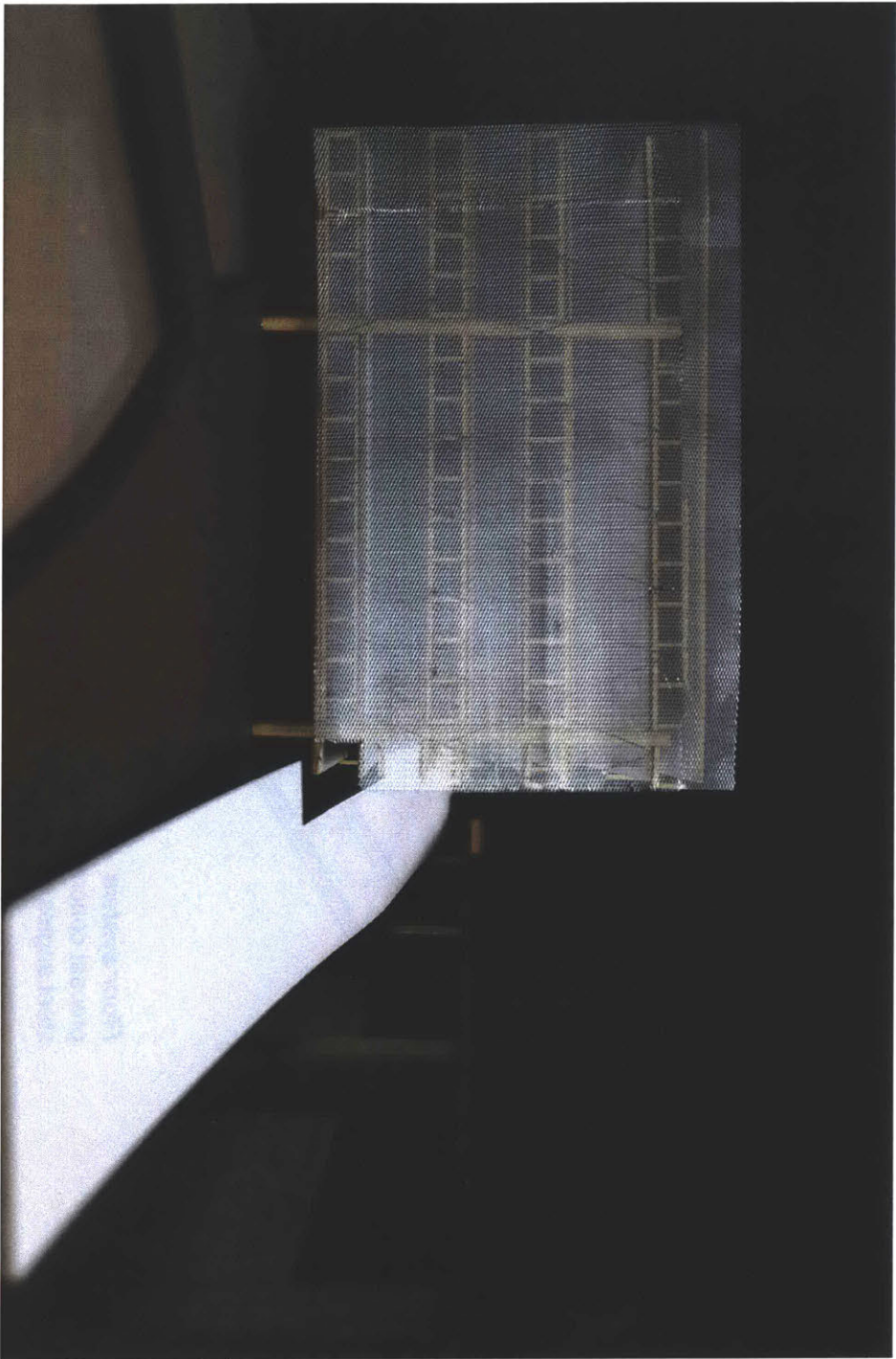


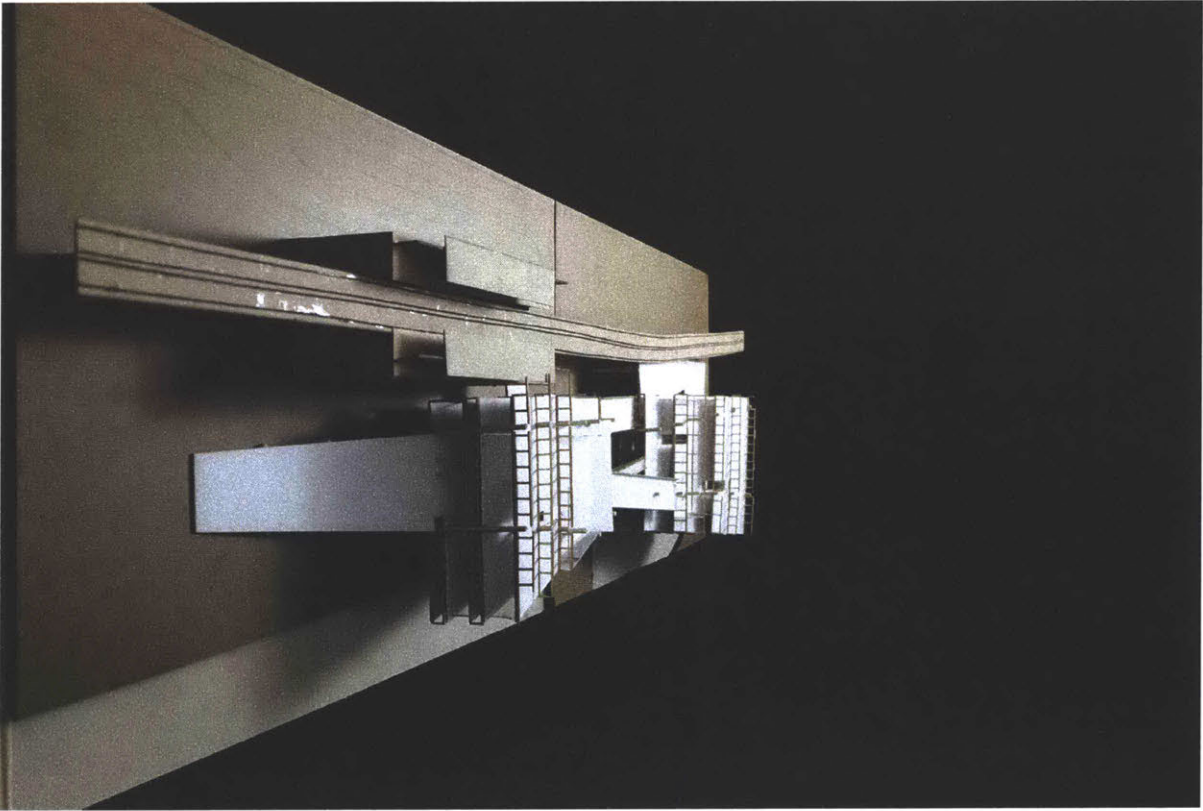


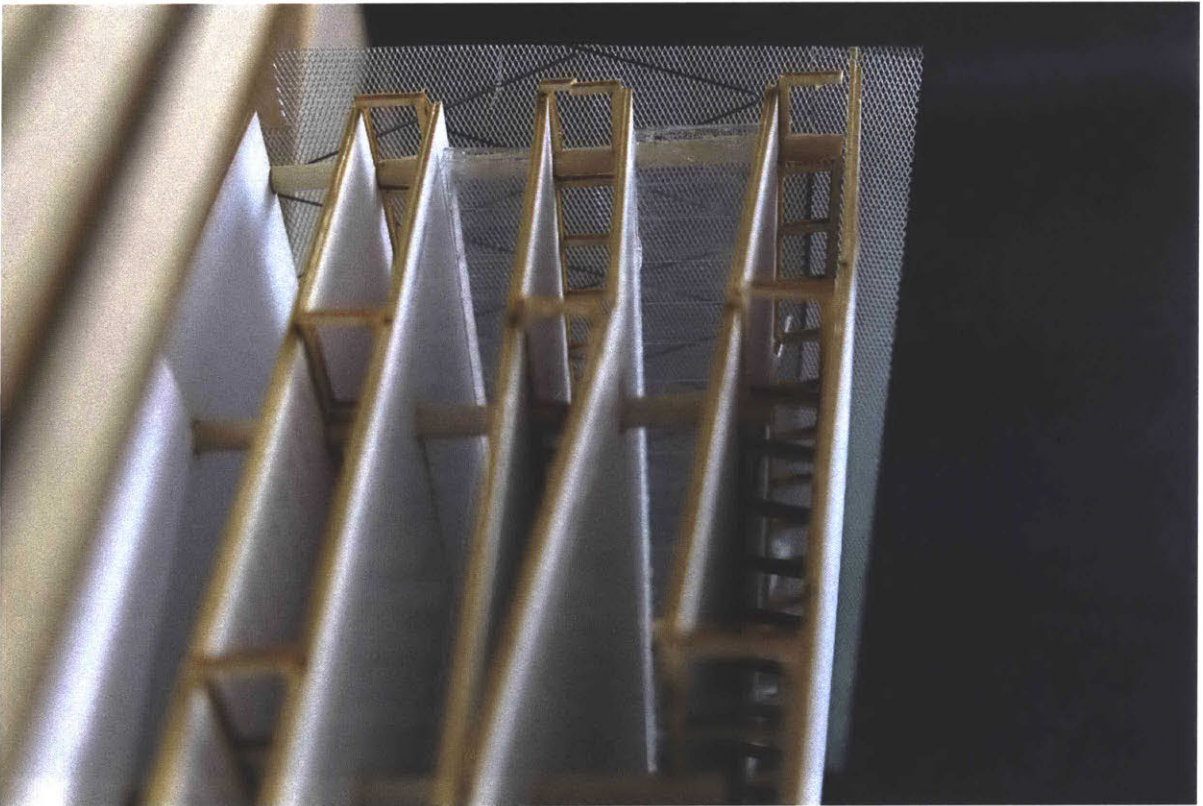
Column and truss system
Wierendeel truss bolt-connected to welded connecting-plates on steel column

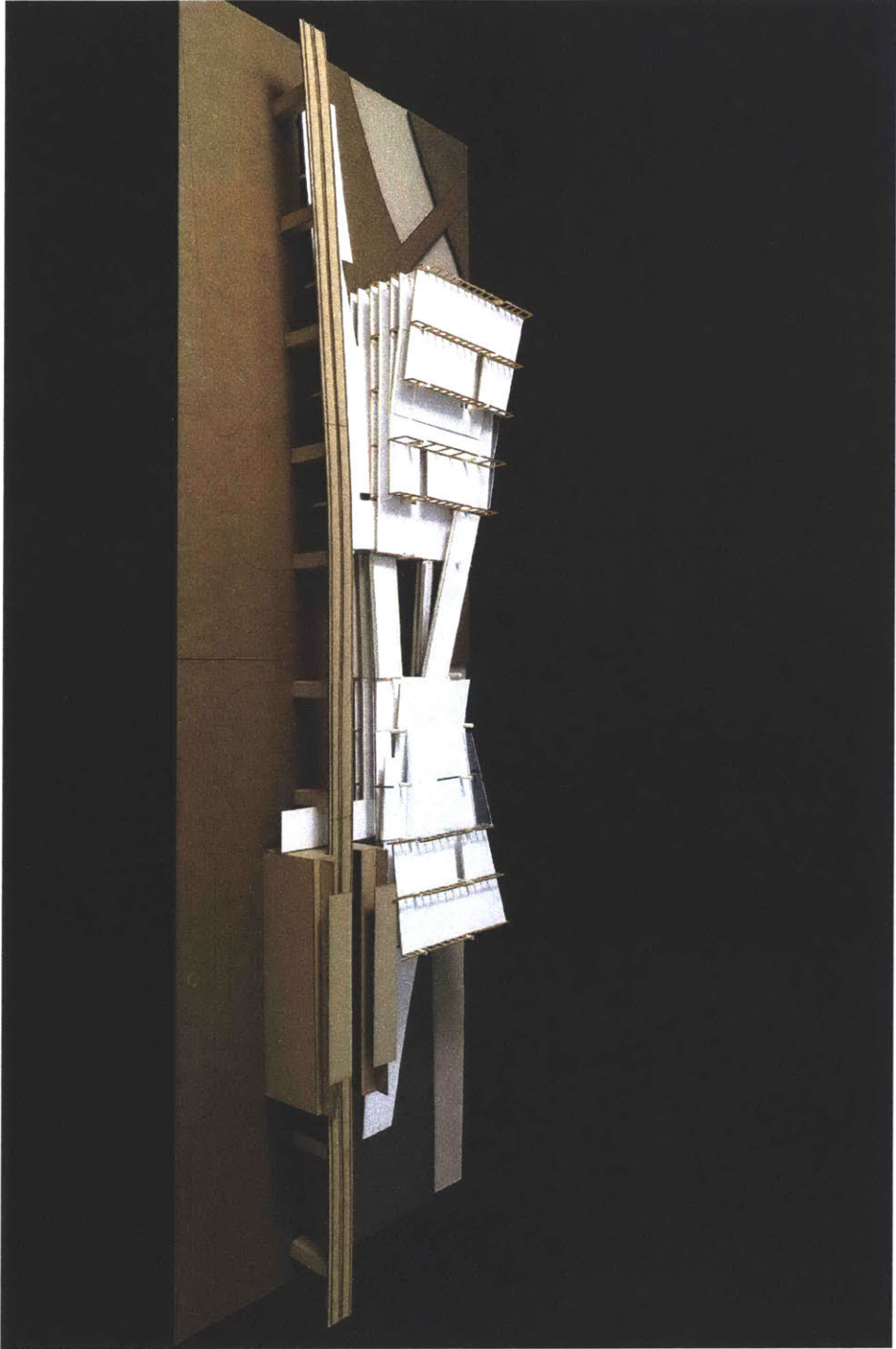


Floor system
precast concrete hollow core planks (w/ re-bar) placed on top of steel angles connected to Vierendeel truss





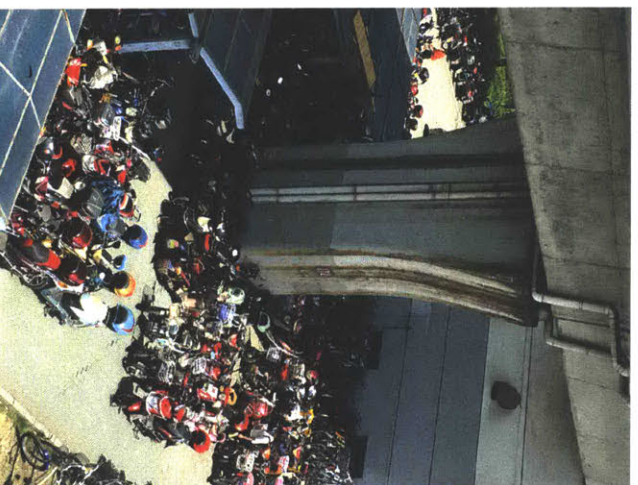
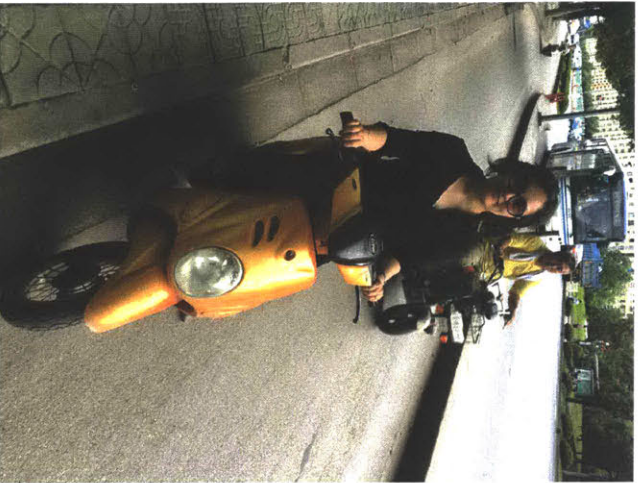






APPENDIX

SITE VISIT CAPTURES



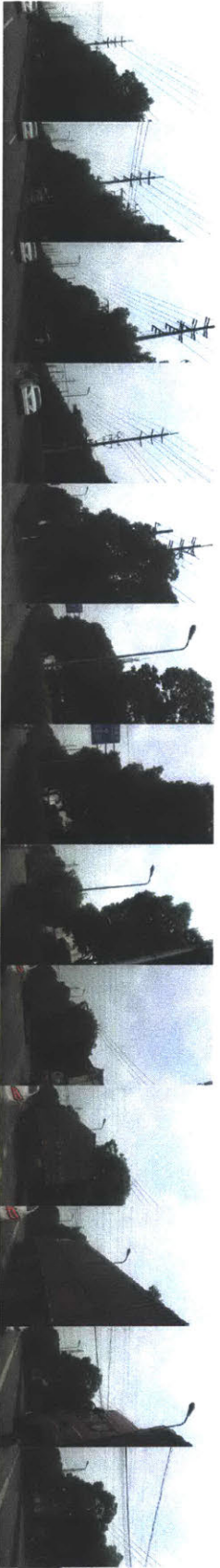
Liping and her scooter, and selfie time :)

scooter everywhere!!

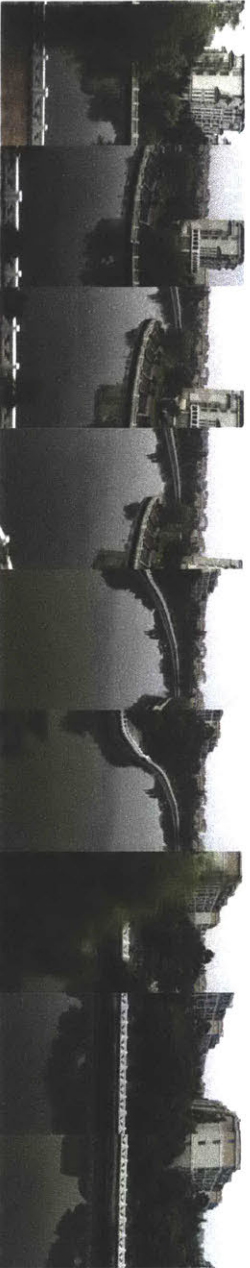
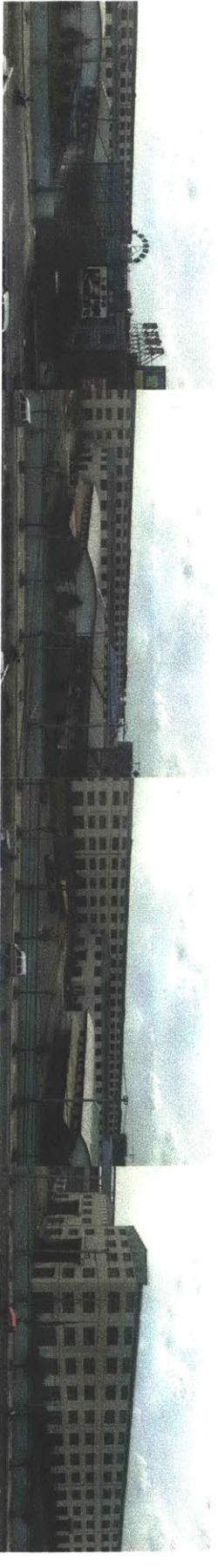
MINHANG VIEWS FROM CAR



MINHANG VIEWS FROM SCOOTER



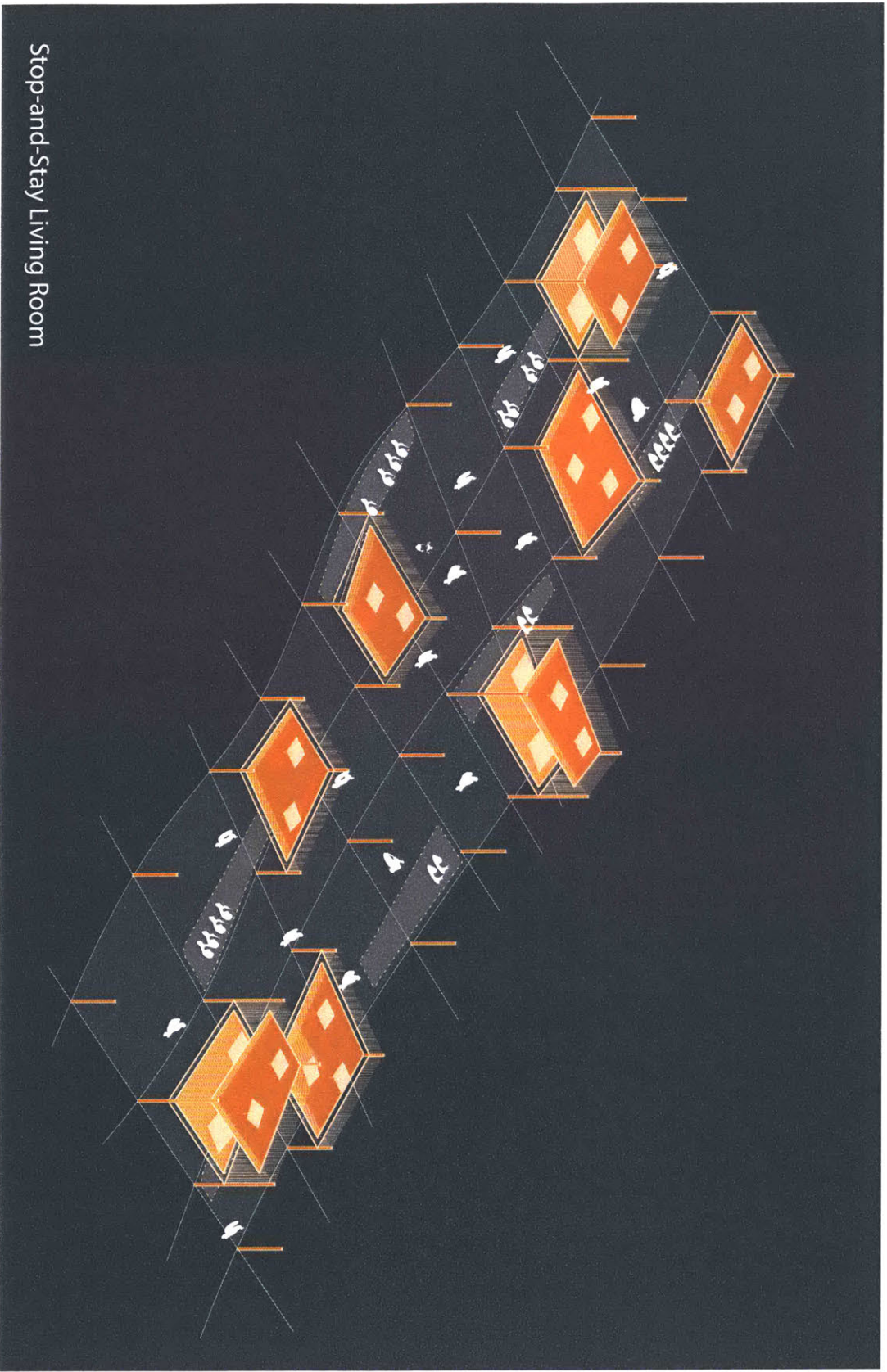
MINHANG VIEWS FROM LIGHTRAIL



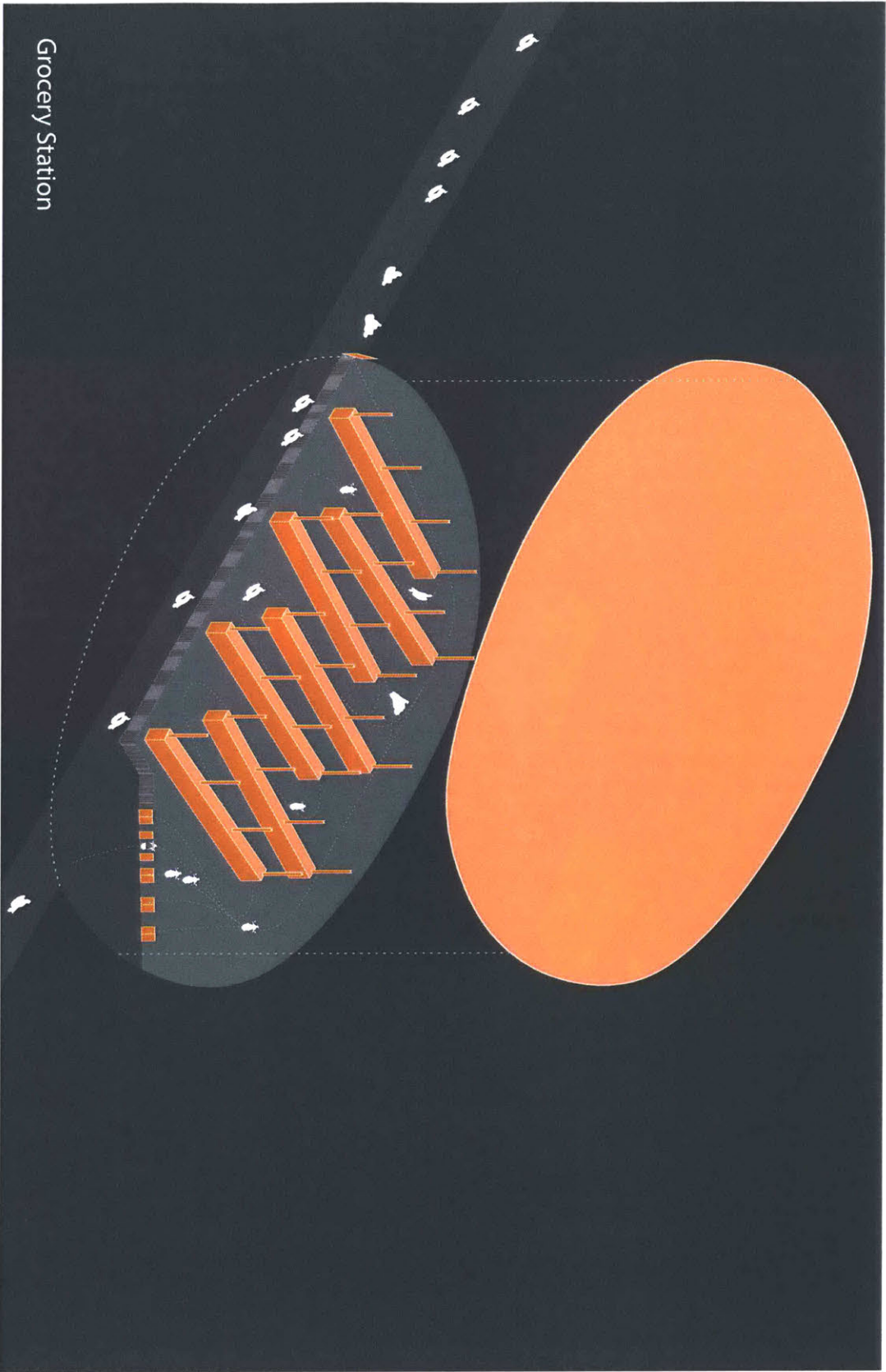
**MAPPING OF AN URBAN SECTION
FROM LIGHT-RAIL LINE TO INDUSTRIAL WATERFRONT**



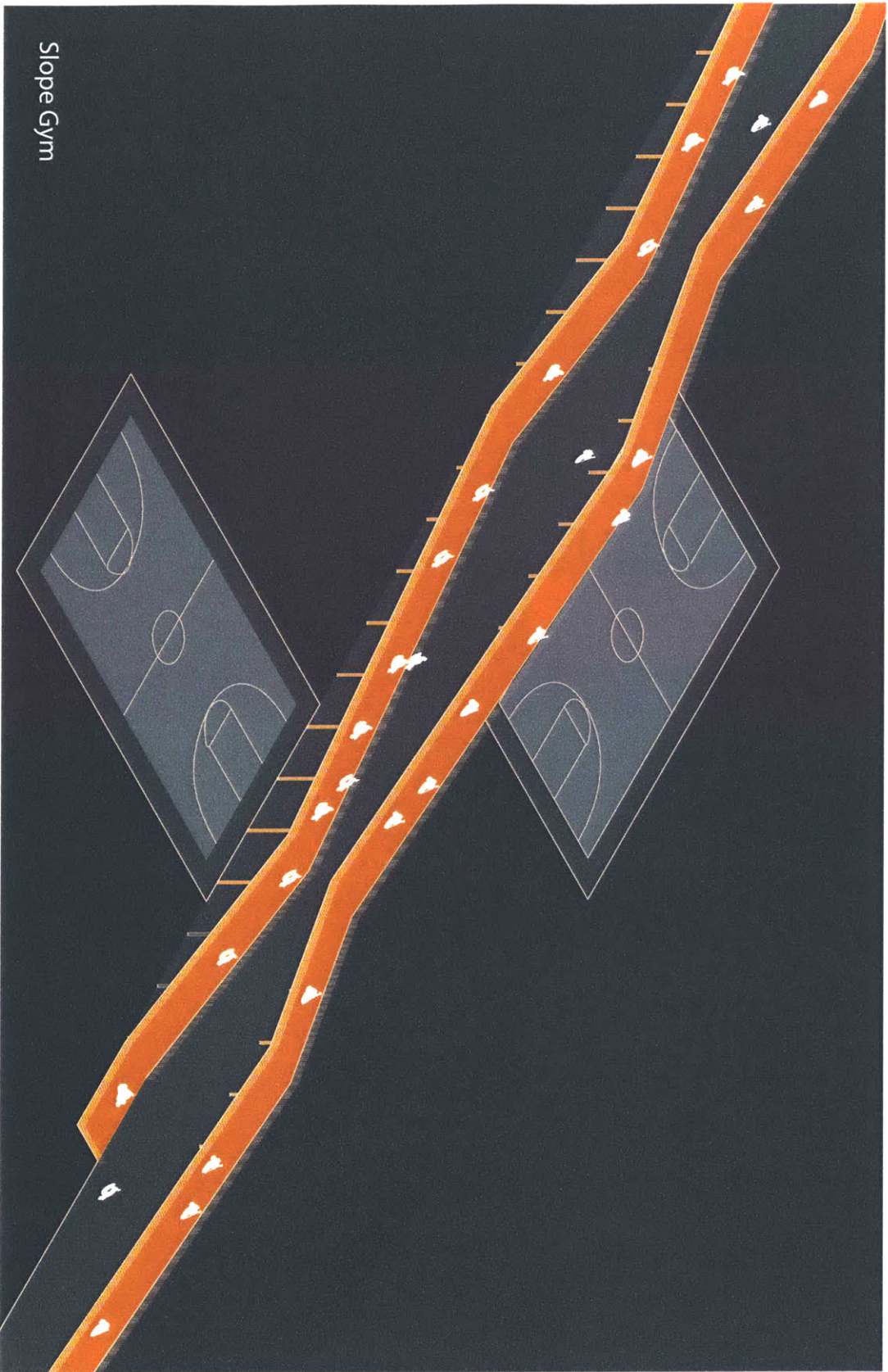
PROGRAM BRAINSTORMING



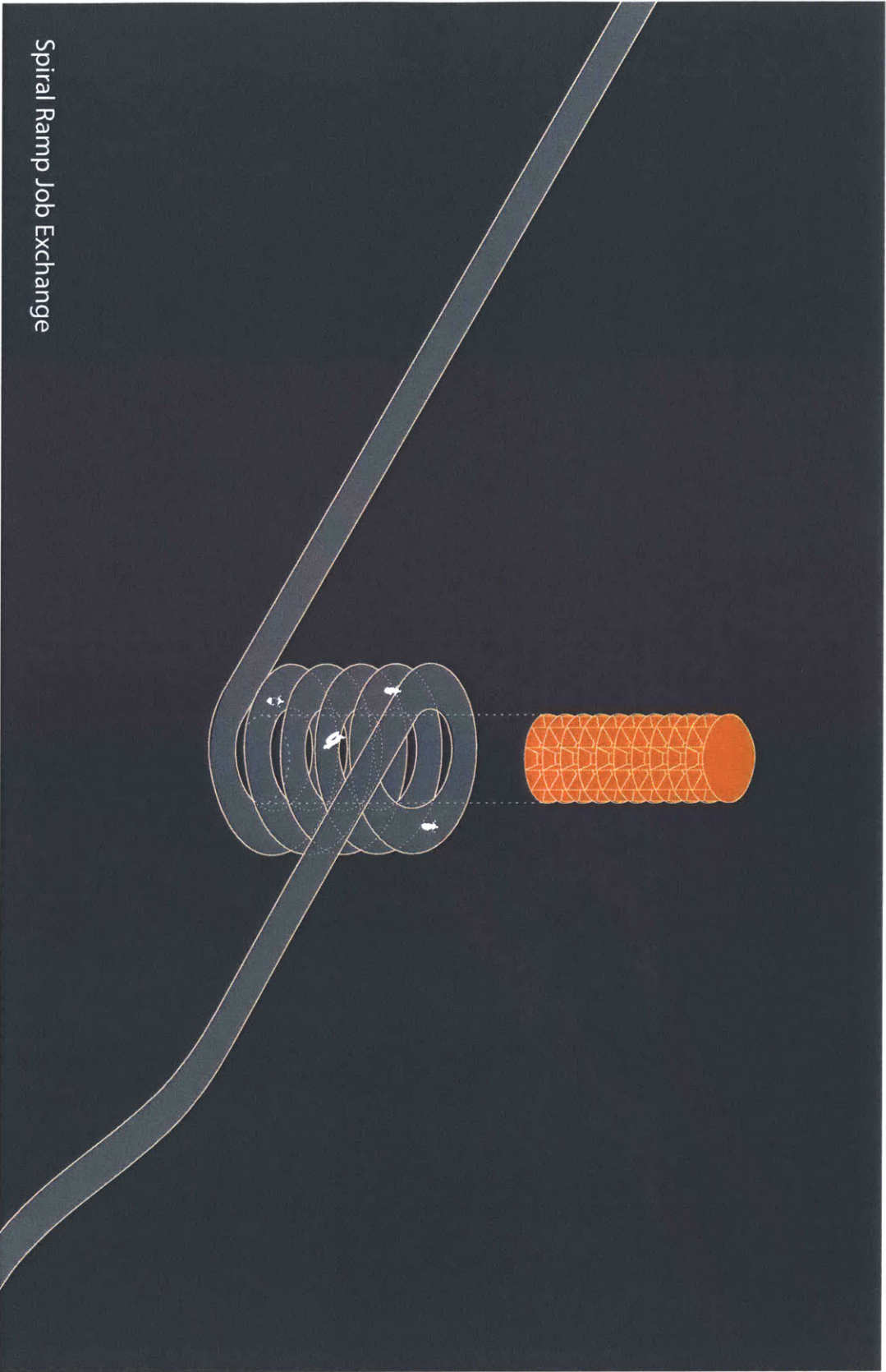
Stop-and-Stay Living Room



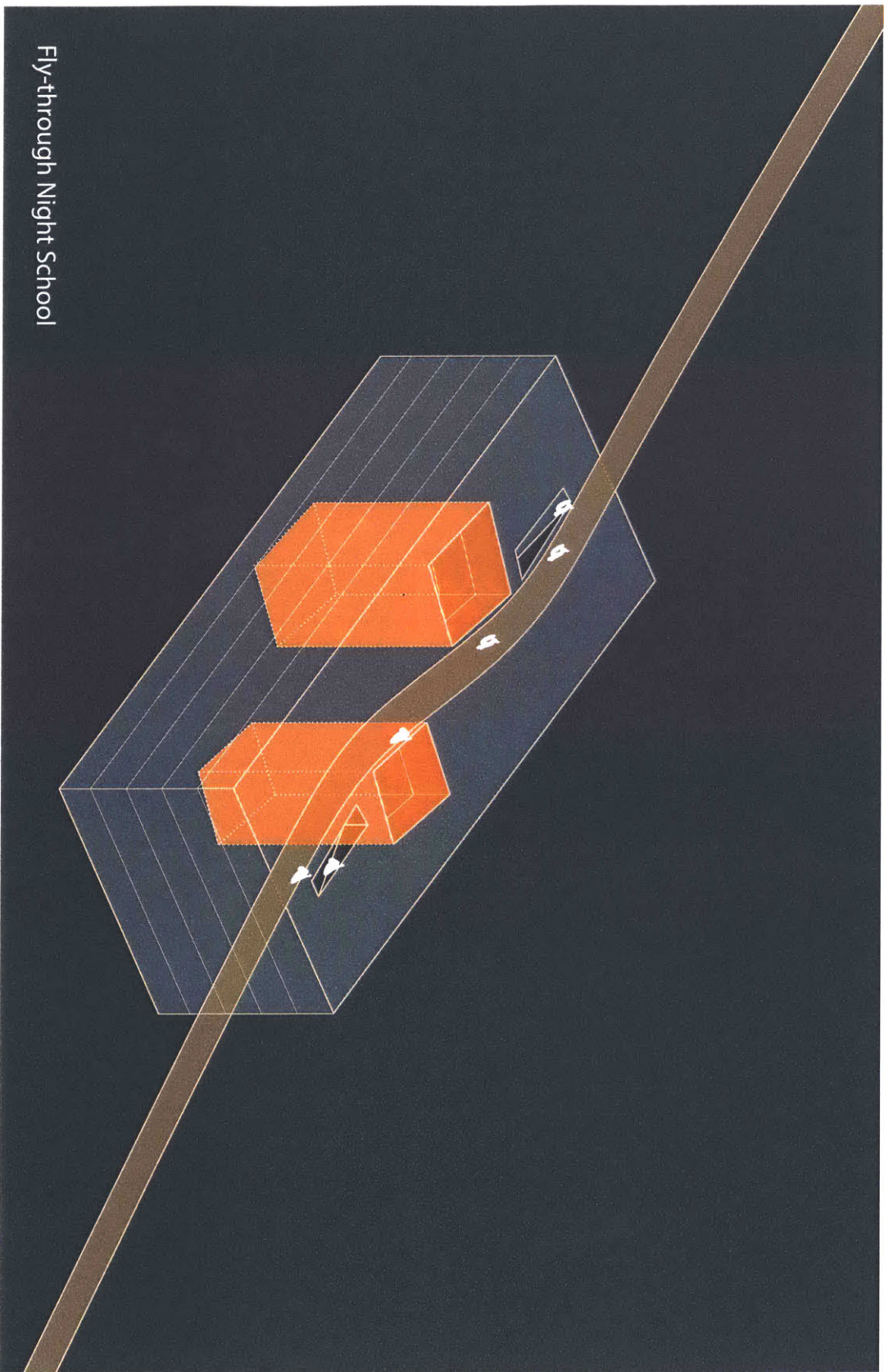
Grocery Station



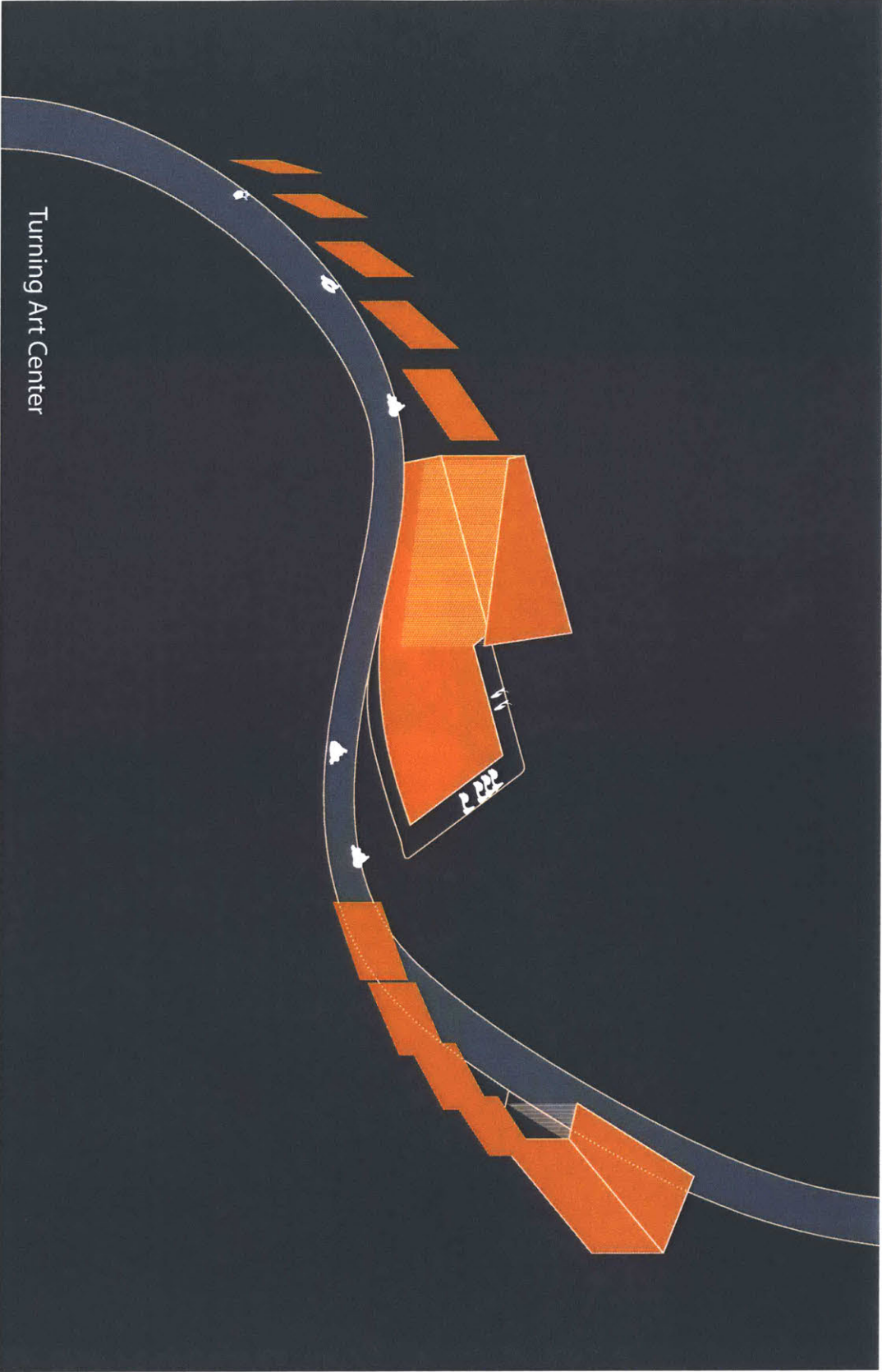
Slope Gym



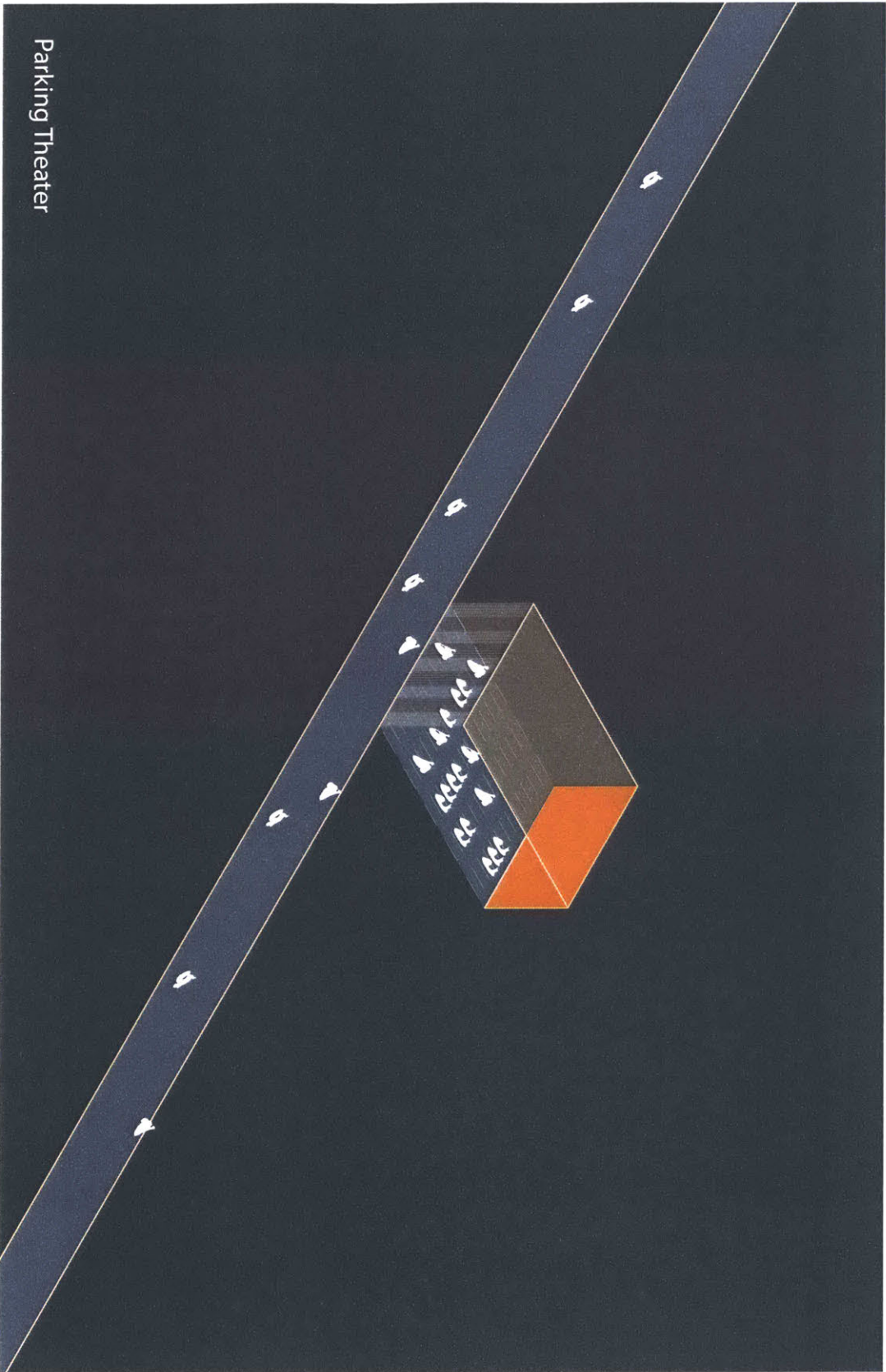
Spiral Ramp Job Exchange



Fly-through Night School

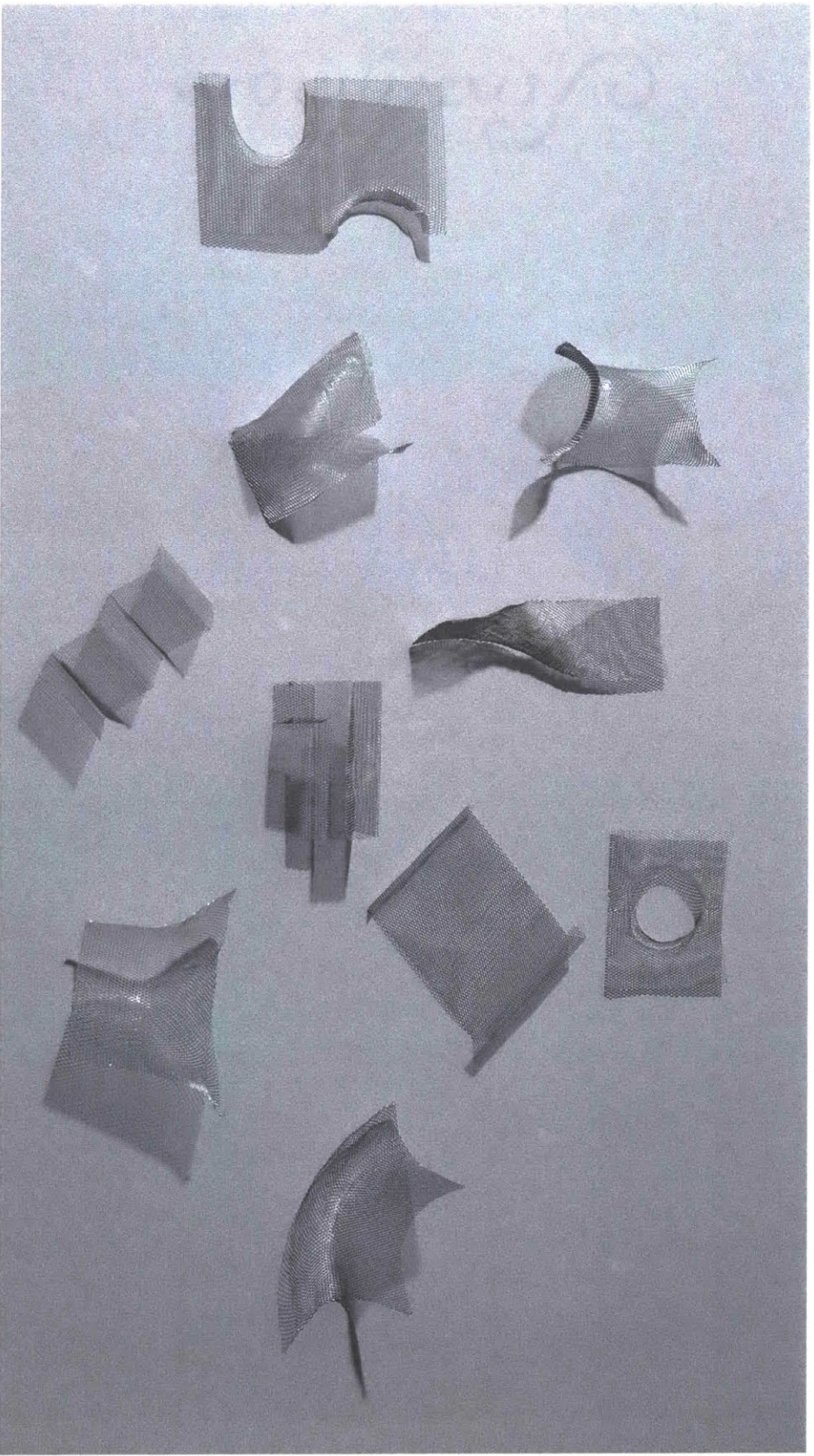


Turning Art Center

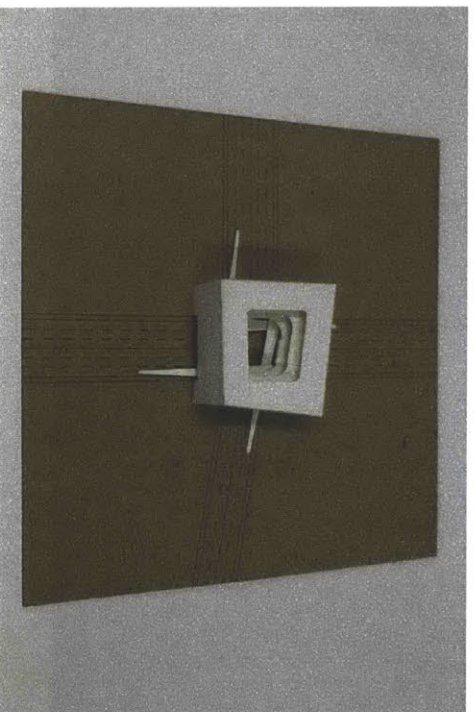
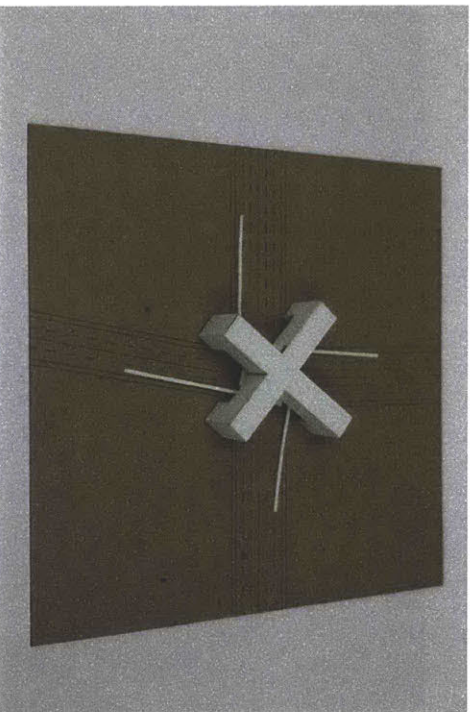
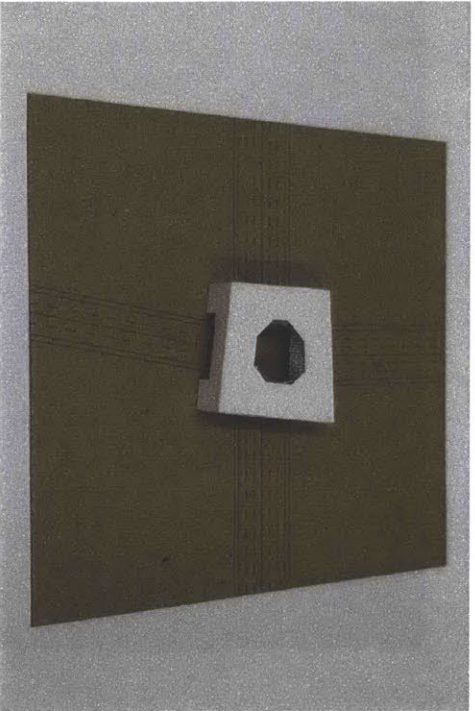


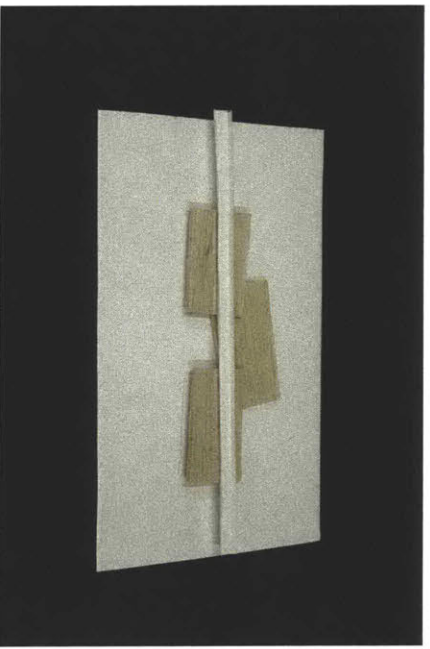
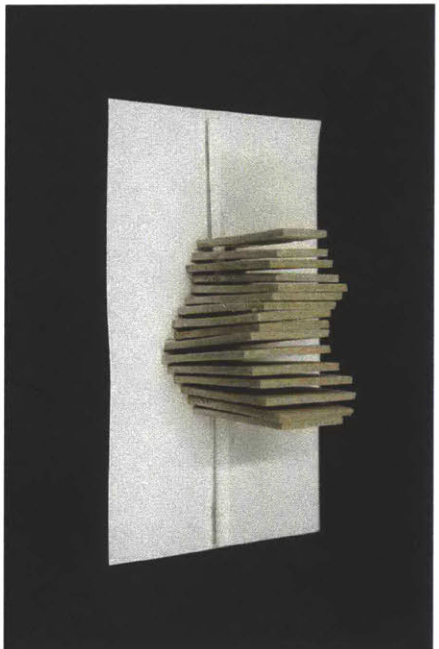
Parking Theater

CHAIN-LINK SURFACE FORMAL EXPLORATION

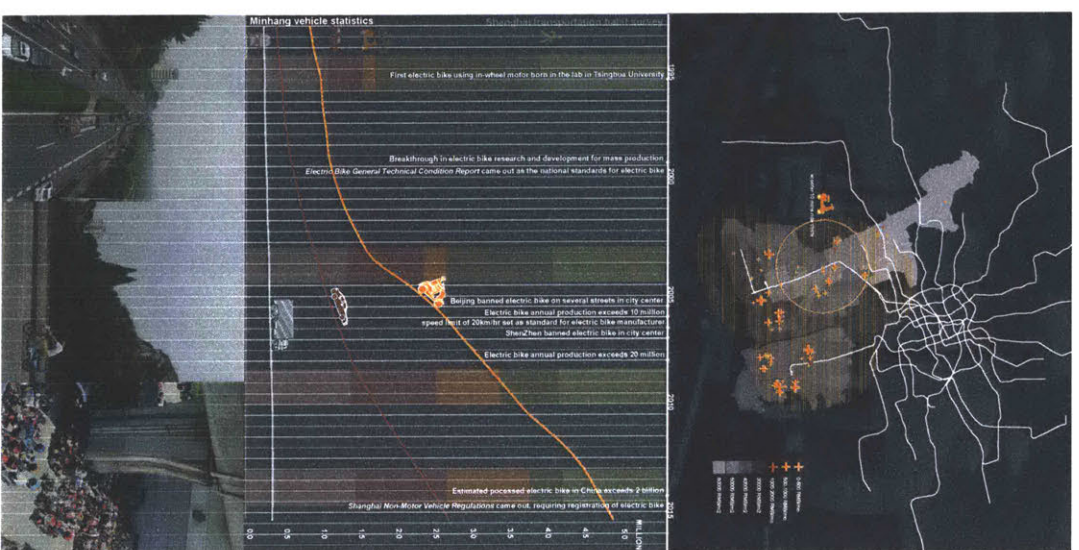
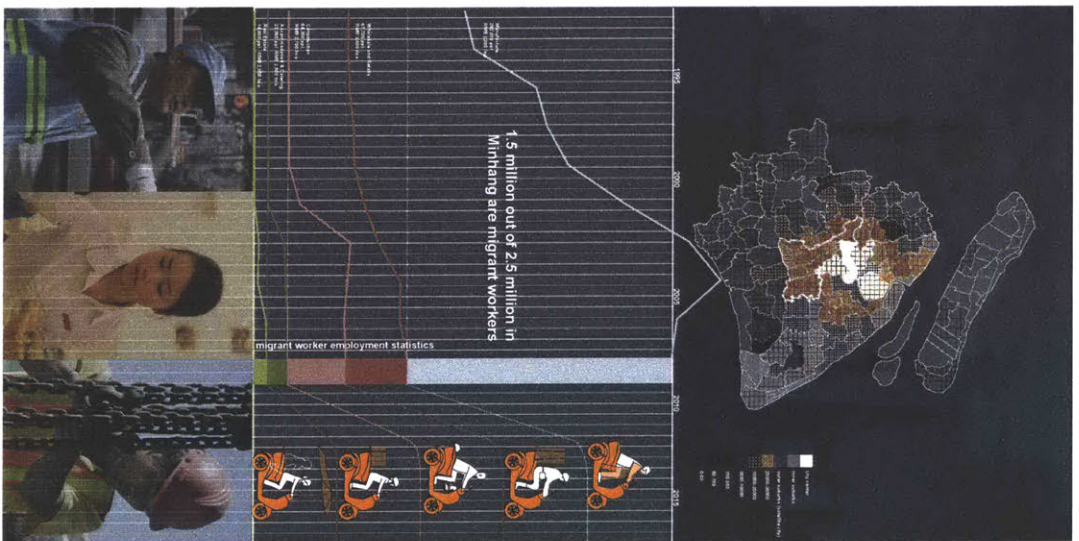
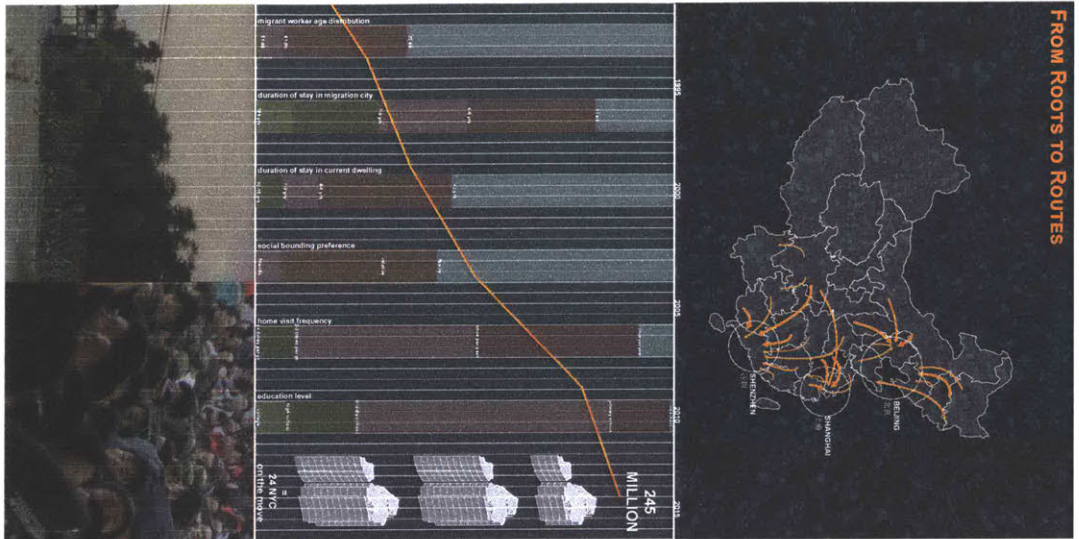


STUDY MODELS

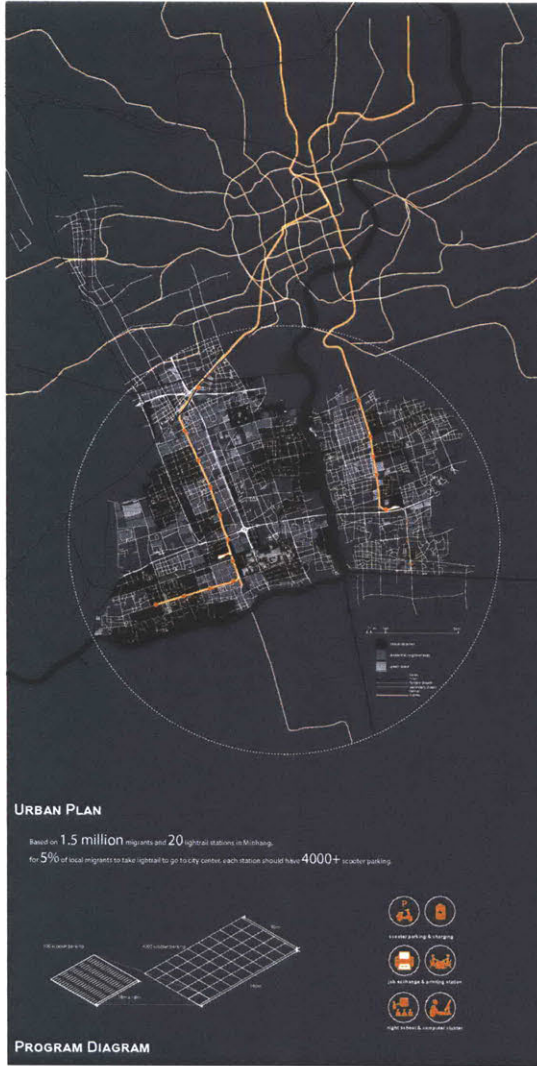


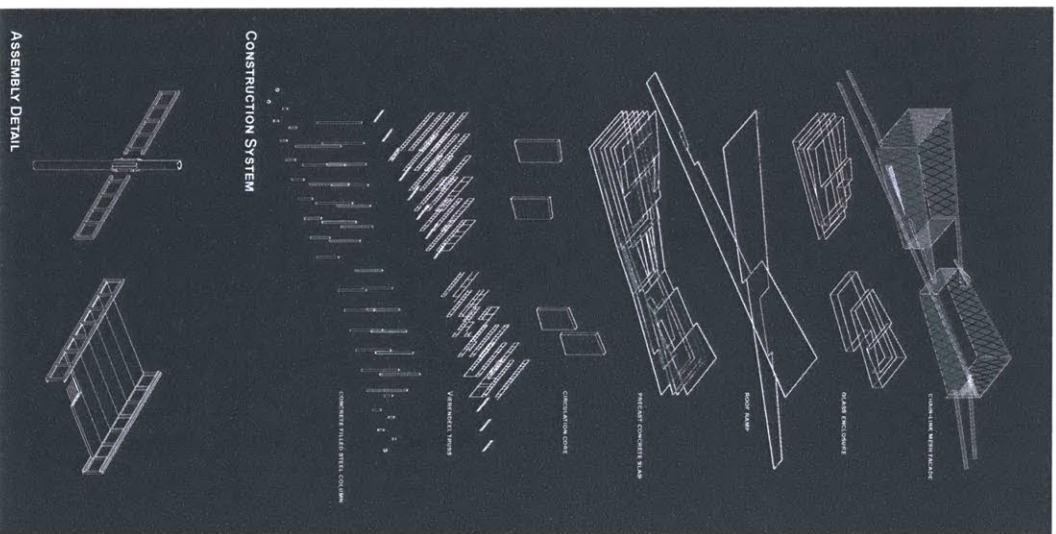
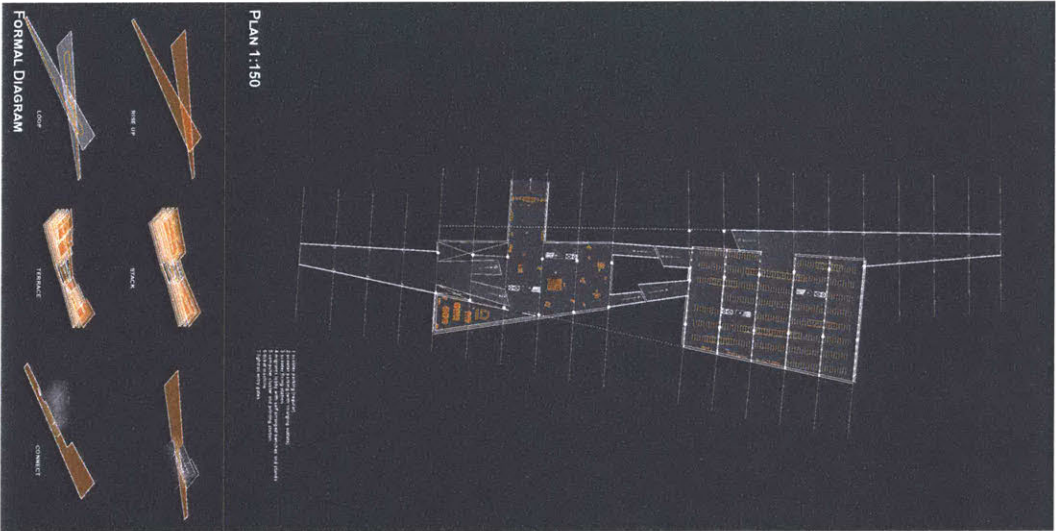


FROM ROOTS TO ROUTES



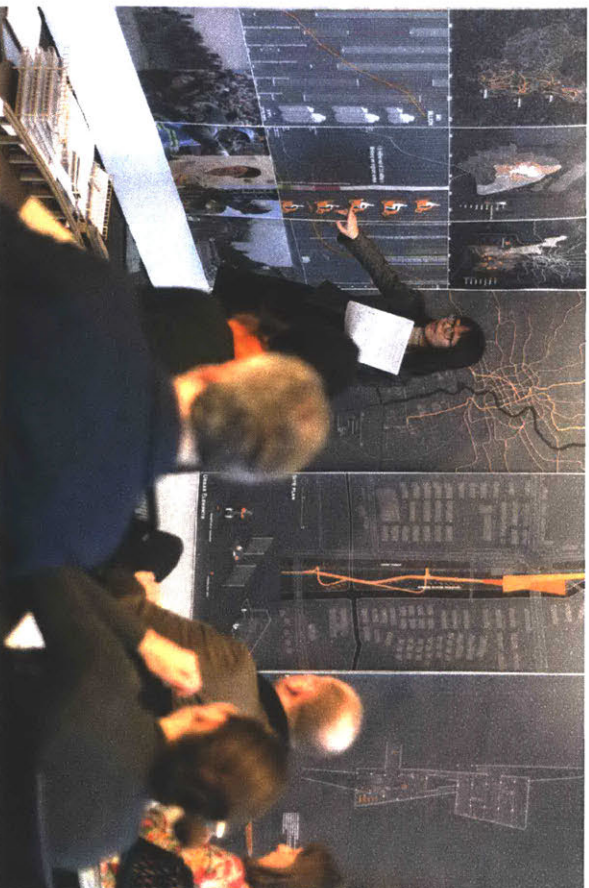
FINAL BOARDS





FINAL REVIEW PHOTO





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(Data entry of every rental housing in Minhang is collected using Octopus, an online data collection software, and consolidated and mapped)